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December 1984

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David Lawrence reveals how to draw graphs

VIC20 JOYSTICKS
How to program from Basic

Steve Lee presents RAT WHACK

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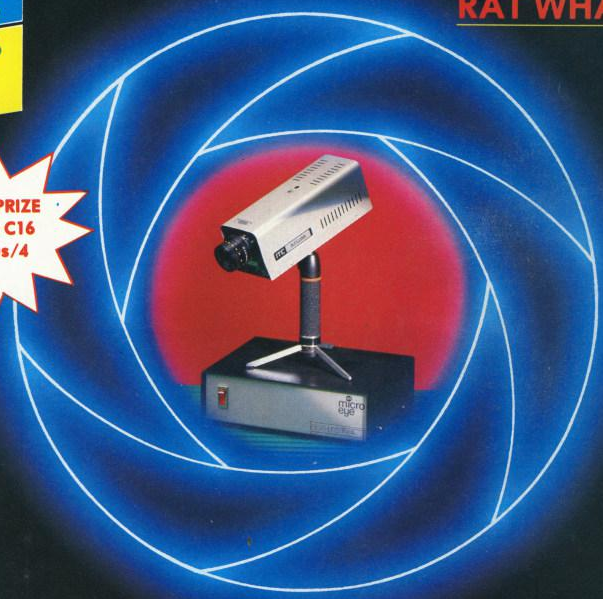

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ABC

Submitting articles
Commodore Horizons welcomes readers' contributions — either articles or program listings. Articles should be typed double-spaced with a wide margin. Programs should, whenever possible, be printed out on plain white paper, accompanied by a cassette. We cannot guarantee to return every article or program submitted, so please keep a copy. If you want to have your program returned you must include an s.a.e.

SUNSHINE

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EDITORIAL

NINETEEN EIGHTY FIVE may yet be the year of the 16-bit computer. The home micro boom, which has been almost exclusively 8-bit based, is due to evolve into a more advanced, and possibly more stable, market. The days of microprocessors such as the Z80, 6809 and 6502 are, if not exactly numbered, at least on the wane.

This is not to say that 16-bit computers are either revolutionary or startlingly new, just that up to now they have been mainly confined to business and upmarket personal machines such as the Apple Macintosh. Sinclair was arguably the first company to break this mould with the £399 QL, based around the 68008 chip. But, many people would dispute this machine's claims to be a true 16-bit machine, limited as it is by an 8-bit buffer.

However, Commodore has announced its intention of joining the field with the purchase of Amiga, a small hardware company based in Santa Clara, California. This company has built a 16-bit home computer which is expected to cost less than $1000 (£750). It should appear in Commodore colours some time next year and might even be on display at the Consumer Electronics Show in Las Vegas in January.

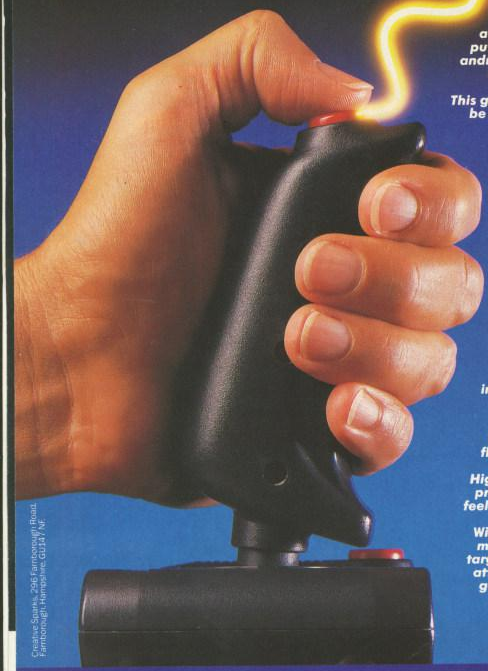
Just to complicate matters still further, Atari is suing Amiga for $100m for alleged breach of contract. Amiga had a development contract with Atari while the latter was still owned by Warner Communications, though the contract was subsequently cancelled by Amiga.

Given that the Japanese have based their MSX standard on the 8-bit Z80 chip, it makes sense for competing manufacturers to upgrade the specifications of their machines. Perhaps Sinclair, which has just launched its 8-bit Spectrum +, will enter the fray with a cheap 16-bit games machine in time for Christmas 1985. Certainly Atari seems to be looking in that direction.

The vogue for judging home computers on the amount of RAM they contain may be passing. The new touchstone could be whether it is 8 or 16-bit — or maybe even 32-bit?

QUALITY CONTROL FROM CREATIVE SPARKS ON C64

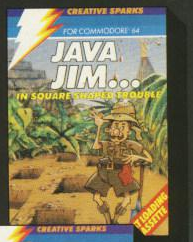
For those who demand excellence



JAVA JIM

Guide Java Jim around the screen digging near square holes as he searches for ancient relics. You will have to avoid the lumps of sizzling lava being continually showered down on Jim from the still active volcano in this highly original fun game.

4 full graphic all action screens.
20 levels of play.
High score feature.
Fast loading cassette.

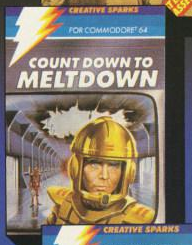


COUNTDOWN TO MELTDOWN

An amazing graphic action adventure game which puts you in charge of a team of androids trying to reach the core of a nuclear reactor before it explodes.

This game has over 2000 rooms to be negotiated and every single one of them is in 3D!!

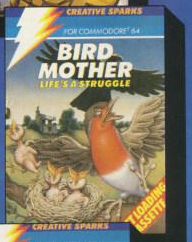
Probably the most exciting game yet developed for the C-64.
Fast loading cassette.



BIRD MOTHER

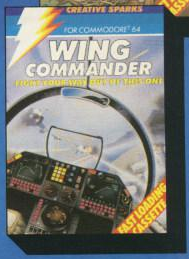
This is a delightfully original game which uses nature as the setting for a highly compelling and challenging game. Guide the Bird Mother as she builds her nest and raises her young, finally protecting them from a predator hawk.

Fast loading cassette.
The stunning graphics and music in Bird Mother are not to be missed.



WING COMMANDER

This is a highly sophisticated flight combat simulator which puts you in the pilots seat.
Highly advanced machine code programming has ensured you feel every stomach lurching dive and roll.
With 17 separate controls to be monitored and several ground targets to be defended from the attacking enemy bombers. This game will stretch your skills to their limits.
Fast loading cassette.



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Your life blood is sales of goods or services at a profit. Your tools are products and customers and your success depends on the quality of information you have on each and how you relate your products to your customer needs. Producing personalised letters and reports for your customers will show your true professionalism.

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The Stock File is really two things in one, a file processor and a word processor. You can set up and manipulate files and then produce reports and letters with information from those files, e.g. stock lists, price lists, quotations, etc.

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SALES MANAGER
T.C. SAPHIER

SOFTWARE MANAGER
C.A. SAPHIER

LETTERS PAGE

D-I-Y reset

I HAVE managed to construct a very simple reset button for the 64 by connecting a push-to-complete switch across pins one and three of the user port. Pressing the button has the same effect as SYS64738, but of course is independent of the keyboard, so any RUN/STOP-RESTORE disabling pokes are rendered useless.

Construction is as complicated as you like; my switch cost 50p and took only three quarters of an hour to assemble. This however is the luxury model, and the "device" can be made for nothing at all using a short piece of wire or a paper clip! The pins used are 1 (ground) and 3 (reset) ONLY, not pins A and C underneath the board.

Crocodile clips with the lower jaws taped over, or pieces of edge connector can be used to wire up the pins, and the effect is to return the 64 to Basic. You could then, for instance, PEEK addresses 2040 to 2047 to look at the sprites — the rest is up to you!

Paul Baylis
Hull
E. Yorkshire

Kiwis compute

THANK YOU for your interesting and helpful magazine, which is available every month in New Zealand, unlike some such as Compute! which we have not seen since April.

A plea for overseas readers — we don't have enough time to enter your competitions by the end of the cover month.

We run a very successul User Group and have a library of cassettes and books and a 1520 printer/plotter. Tapes can be borrowed freely, and as a club we can afford to buy more programs than people would individually — although they cost a small fortune here, cartridge games averaging $79-$99, though good cassette games have come down recently to $24.99.

Please, more educational programs and programs for the 1520!

Brenda McLeish
Bay of Islands Computer Group
PO Box 119
B.O.I.
New Zealand

Beating Beach Head

WITH REGARD to the letter on BeachHead from Ian Davies of Mid-Glamorgan; high scores can be achieved due to a slight glitch in the tank section, when the pink enemy tank appears. Shoot it and keep shooting at the 1000 point score flash — it will add 1000 points each time you hit it. But don't leave it too late or you'll crash.

My high score on BeachHead is 156,600.

Sean Miller
Yeovil

WE'RE STILL pondering whether to include a high-score section in *Horizons*. Any comments?

Back-answer

I REFER TO THE "overlay" technique for Basic programs, described in Answer Back in August.

I tried out a pilot program on my Vic, and found that the new program would retain all numeric variables correctly from the old, but that with string variables the wrong string would frequently be returned. I would be most grateful if you could let me know how to overcome this program on the Vic.

John W Dunster
Chigwell
Essex

THIS answer relates to all Commodore machines. If a string is defined in the text, then that string is taken from the text upon program execution. However, when you load another program that text is overwritten, and that pointer then calls apparent garbage.

When a string is created by the program, then the strings are stored in high memory, growing downwards from the top of Basic.

These are safe from being overwritten by LOAD from within a program.

The answer to your problem, then, is to redefine the string without changing it, and the redefined string will reside in high memory. For instance, if your program line reads 100 a$ = "NAME", then alter line 100 to read 100 a$ = "NAME":a$ = a$ + "".

The "" adds a null, and has no effect on the length of the string.

Time, gentlemen...

I'M WRITING in reply to John Worts' problem with **Pubquest.** When you get to the danger sign, throw your paving slab and continue north. After doing this you can return to the tramp, say something, and quench his thirst.

Evan Jones
Yeovil

IF THINGS go on like this, we'll have to start up an adventure column. What do you think . . .?

This is the chance to air your views — send your tips, complaints and compliments to Letters Page, Commodore Horizons, 12-13 Little Newport Street, London WC2R 3LD

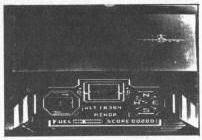
NEWS DESK

Tymac all talk?

TYMAC TALKIES look like making a big impact on the Commodore software market, when the games, which incorporate speech effects generated with no extra hardware, are released in the UK.

Tymac's origin is as a manufacturer of precision engineering tools in the USA. From there the company diversified into home computer peripherals, and now a range of Tymac software is to be marketed by a UK wing.

Spokesman John Sage explained that the speech routines, developed specially by Tymac, add an extra dimension to the games without adding the cost of speech synthesis hardware. Moreover, Tymac's graphics routines are very impressive, especially on Vic 20 games like **Samurai**, an exciting martial arts battle game, and **Code-name Deadzone**, an underground rescue mission featuring colourful perspective graphics.



Tymac's first release will be **Flyer Fox**, which was the subject of negotiations with the **US Gold** label at one time. **Flyer Fox** is a combat flight simulator in which you control a fighter assigned to defend airliners against enemy attacks.

Other forthcoming titles include **Gandalf**, a magical arcade adventure; **Pegasus**, based loosely on the scenario of the film **Clash of the Titans**; **First Strike**, a nuclear war simulation; and **Type-Snyper**, a typing tutorial program which is actually fun.

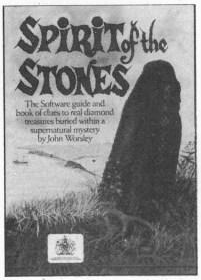
Tymac games will be £14.95 on disk and £9.95 on tape. Contact John Sage, Tymac, Nettleton House, Calthorpe Road, Edgbaston, Birmingham, 643-8899 for further details.

CBM's spirit of adventure

COMMODORE'S new book-and-software arcade adventure **Spirit of the Stones** offers 40 prizes of jewelled "talismen", as well as the chance to win a share of the Royalty Fund based on the number of units sold.

The book on which the program is based is by John Worsley, and is set on the Isle of Wight. The supernatural adventure, involving smugglers, murderous revenue men and hidden diamonds, offers clues to the location of the prizes on the Isle itself — but you don't need to travel to solve the riddle and find the treasures.

The book was released in the South of England six months ago, and already four of the jewelled prizes have been found. When the Commodore book-and-software package reaches the shops in November, it will include extra


SPIRIT of the STONES
The Software guide and book of clues to real diamond treasures buried within a supernatural mystery
by John Worsley

clues in the arcade game, which features a scrolling map of the island and 21 arcade challenges showing evil spirits blocking your attempts to find the diamonds. The program is by Ian Grey, responsible for many of Interceptor's most successful programs, and Lee Braine.

Solving the arcade games reveals code letters which must be combined with the runic clues in the book to unravel the mystery of the hiding places of the talismen and the Great Wight Eye.

The cassette or disk-based package will cost £14.99, and 50p from each sale will be contributed to the Royalty Fund. The Fund will be divided with one share going to each finder of a talisman, and ten to the finder of the Great Wight Eye. It will be closed in 1993, or at £1m, or when all the talismen have been found.

Dynamite database

IF YOU HAVE a use for a 64 database program, but don't want to pay 50 or 60 pounds, Dynamite Software might have the answer with **Database 64.**

The tape-based program costs £7.99, and allows up to 30,000 records with 15 fields per record, 25 bytes per field and 255 bytes per record. The Database is menu-driven and contains on-screen help messages. Scrolling, save/load, add, insert, delete and amend are fully implemented.

Dynamite also offers a **64 Assembler/Disassembler** package, which allows variables, labels, pseudo ops and control commands. The disassembler will deal with any part of the 64's memory, including the operating system and Basic interpreter.

The Assembler/Disassembler costs £7.99 on tape, and comes with a manual.

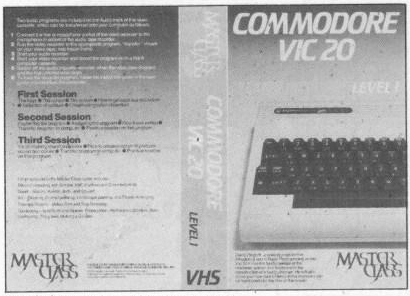
For more details of these and other Dynamite packages, contact Dynamite Software, BCM 8713, London WC1N 3XX.

Vic on video

IF EVEN the best programming tutorial book leaves you in the dark, perhaps Master Class Video can supply some illumination.

There are four videos in the Commodore programming series; Vic 20 Level One and Two and Commodore 64 One and Two. Each of the one hour cassettes is presented by David Redclift, who demonstrates screen and keyboard techniques, data entry, and more advanced programming techniques. As a bonus the soundtracks of the cassettes contain Basic programs which can be loaded into the computers. The video cassettes are available in Betamax and VHS formats, at a cost of £19.95.

For details of these and a range of other packages, contact Dynamite Software, BCM 8713, London WC1N 3XX.



Master Class video — learn as you watch

LVL in tune with Echo system

FOLLOWING last month's release of Commodore's Music Maker clip-on keyboard for the 64, hardware specialist LVL takes another approach with the introduction of the **Echo 1** full-size mechanical keyboard.

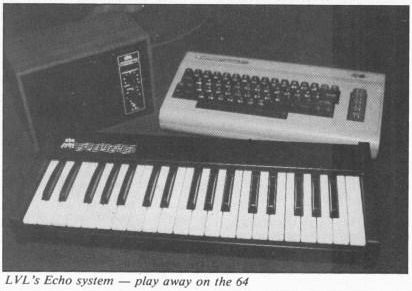
The **Echo-1** is a three-octave unit with a wood and metal case, costing £99.95.

Also available is an amplifier output kit, **Echokit**, which enables you to connect your 64 to the £49.95 **Echosound** amp/speaker unit. This 6watt, 6-inch dual cone device has volume and tone controls and a wooden cabinet.

The Echo-1 keyboard comes complete with a software package, **Organ Master**, which allows programmed and real-time control of the SID chip. Additional Echosoft packages are in preparation.

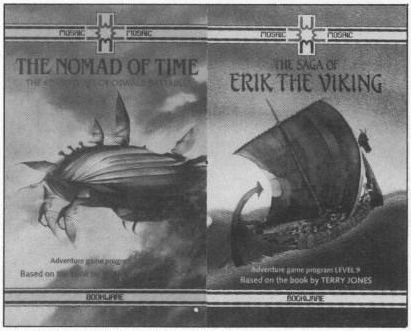
We hope to carry a full review of the Echo system in a forthcoming issue.

Contact LVL, Scientific House, Sandiacre, Nottingham, 0602-394000.



LVL's Echo system — play away on the 64

Oswald, Erik and Jim's adventures



Moorcock and Jones go soft with Mosaic

MOSAIC PUBLISHING has announced three more "bookware" packages based on best-selling paperbacks.

The Saga of Erik the Viking, by Monty Python star and mediaevalist Terry Jones, contains a 64 program and a 20-page booklet. It's a text adventure programmed by Level 9, costing £9.95.

Harry Harrison's **The Stainless Steel Rat Saves the World** is an illustrated text adventure complete with a copy of the hilarious sci-fi spoof paperback starring Slippery Jim DiGriz, the galaxy's sneakiest con-man turned secret agent. Cost is again £9.95, as is that of **The Nomad of Time**, an illustrated text adventure based on Michael Moorcock's Oswald Bastable series. Programmed by Shards, **The Nomad . . .** comes with a 16-page booklet.

Contact Mosaic, 187 Upper Street, Islington, London, 01-226 0828.

Mirrorsoft seeks the practical touch

MIRRORSOFT, known so far largely as a producer of games aimed at the young end of the market, has branched out into "practical software". The **Home Discovery** series is a suite of five programs for the 64 and other machines, and comprises a weight control program, **"The Joffe Plan"**; a **"Know your Own Personality"** package based on a book by Hans Eysenck and Glenn Wilson; **"Know Your Own Psi-Q"**, a psychic self-testing program by Carl Sargent, Head of Experimental Psychology at Cambridge; **"Star Seeker"**, an astronomy program developed in conjunction with the London Planetarium; and **"Mastermind"**, the program of the programme; courtesy BBCTV.

Most of the Home Discovery series has been written by Ivan Berg Software. Cassette versions will cost £9.95 and disks £12.95, and the packages will be available mail order from Mirrorsoft.

Home Discovery — 64, know thyself

Supabasic offers 72 extras

INTERCEPTOR, best known for arcade games for the 64 and Vic 20, has made an entry into the utilities market.

Interceptor Supabasic is a Basic extension package adding 72 programming commands for the 64. Areas covered include hi-res graphics, sound, sprite control and programming aids. The package comes with a 40-page manual.

Supabasic sets a precedent by being available at the same price for disk or cassette versions — £9.99.

We'll be reviewing Supabasic in a future issue. Meanwhile contact Interceptor at Linden House, The Green, Tadley, Hampshire for more details.

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Diskey gives your Commodore 64 the file handling and disk editing capabilities a serious user needs. Copy SEQ, PRG or USR files with ease. Allows you to examine, copy, or modify any disk. Rescue data from a crashed disk, or simply recover scratched files. For one or two disk units. Also available, for single disk users, is the slightly less versatile but no less powerful SUPERDISK UTILITY (£13.50).

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Easy to use but very powerful spreadsheet. Option to define cells by word labels. Sorts columns/ros numerically or alphabetically. Output to Commodore printers only. Very highly recommended. (Companion books on its use available.)

CALCRESULT
£95
(Handic) — cartridge + disk

Has true 3D (multipaging) facility and histogram features. Versions for Commodore and Epson printers. This is a very powerful and much respected spreadsheet. Single page version £47.50 (cartridge).

MICRO ASSEMBLER
£55
(Supersoft) — cartridge

Features three pass assembler, unlimited labels, source files can be linked, monitor, screen editor, disk or tape operation. Plus AUTO, DELETE, FORMAT, FIND, NUMBER, DISASSEMBLE, OUT and TABLE. Monitor has standard TIM commands plus hunt, transfer and disassemble.

HS-64 ASSEMBLER DEVELOPMENT SYSTEM
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(JCL Software) — cart + disk

Cram-packed with all the features you need to write machine code, BASIC and hybrid programs. Cartridge and disk with assembler, editor, DOS support and a sophisticated monitor. Disk includes assembler and worked examples which you may be able to link to your own programs. Features include AUTO, FIND, CHANGE, DELETE, TYPE, GET, PUT, DO, LIST, RENUM, JOIN, SCROLL, CBM, ASCII, RBAS, SIZE, SETBRK, CLRBRK, BOOM, and number system conversions. And there's a great deal more — including a line insertion feature! This is the most versatile assembler toolkit available for the 64 — the one that the chaps at Corby use! A special deluxe version with the assembler also on ROM is available (£POA).

KOALKAPAD
£80
(Koala Tech Corp) — cart or disk

This really is a great device for getting even the youngest of kids to relate to the computer — but capable of much else and fun for the whole family! Comes complete with KoalaPaint which is fantastic for graphics. Facilities include zoom, copy, colour swap, draw, lines, rays. Pictures can be saved to disk, dumped to printers or incorporated within your own programs! Programmers Guide — disk £14 — outlines ways in which the pad may be used and explains programming needed. Support programs (disk) include LOGO Design Master (£33), Spelling (£33), Colouring (£25). Other 'pads' are available.

MICRO-SIMPLEX
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(Micro Simplex) — disk

If you're in a cash business and need to maintain an accurate audit trail and VAT record, this is the program for you! Will save hours of paperwork. Fully recognised by the authorities — it's based on the Simplex book-keeping system. Suitable for schemes A to F. Demo available.

THE LAST ONE
£57.50
(DJ 'A1' Systems) — disk

SPECIAL OFFER PRICE!!! Program generator that frees you from the drudgery of writing tailor-made data management programs. Create commercial, sellable database programs with ease. TLD creates standalone error-free coding in standard BASIC which can then be compiled if required (PETSPEED £50). Input is in the form of one-line descriptions defining, in plain English, the user's requirements. Programs you create can be for any application and as simple or as sophisticated as you like. Very, very highly recommended — BUT HURRY!

S.A.M.
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(Tronix) — disk

This is SOFTWARE AUTOMATIC MOUTH, a quite outstanding piece of software which gives your 64 limitless speech synthesis capability. Offers English text-to-speech or phonetic input in direct or program modes. Full control over pitch, speed, inflexion. Expensive maybe, but there's nothing like it, even on hardware!

SUPERBASE 64
£48
(Precision) — disk

Really excellent database management program, still at our special price. This one's the best of its type and a must for all serious 64 users. Can be used for anything from mailing lists to stock control and invoicing. Lets you tailor a database, its prompts and displays to your exact requirements although the core program always remains the same. Has database features that are easy to use yet powerful beyond the needs of mere mortals! STEPPING STONE and HOMEBASE application modules — for use with Superbase — also now available. Details on request.

FLIGHT SIMULATOR II
£40/£33
(Sublogic) — disk or tape

This is so good the authors think you can learn 'the ropes' as far as instrument control and flying are concerned! Whatever, the simulation is quite excellent. Expensive but it's the best on for the 64 by far — and a MUST for the collection!

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BOOKS

There are some 64 books specifically about the 64! We have a full list (50p) with a description of many other books of interest. We can supply ANY book at cover price plus 75p each towards P&P.

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Really excellent book for those keen to get to grips with 1541 use. Absolutely everything you need to know — includes ROM listings, use of programs such as COPYALL on the test/demo disk.

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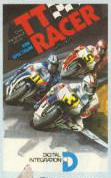

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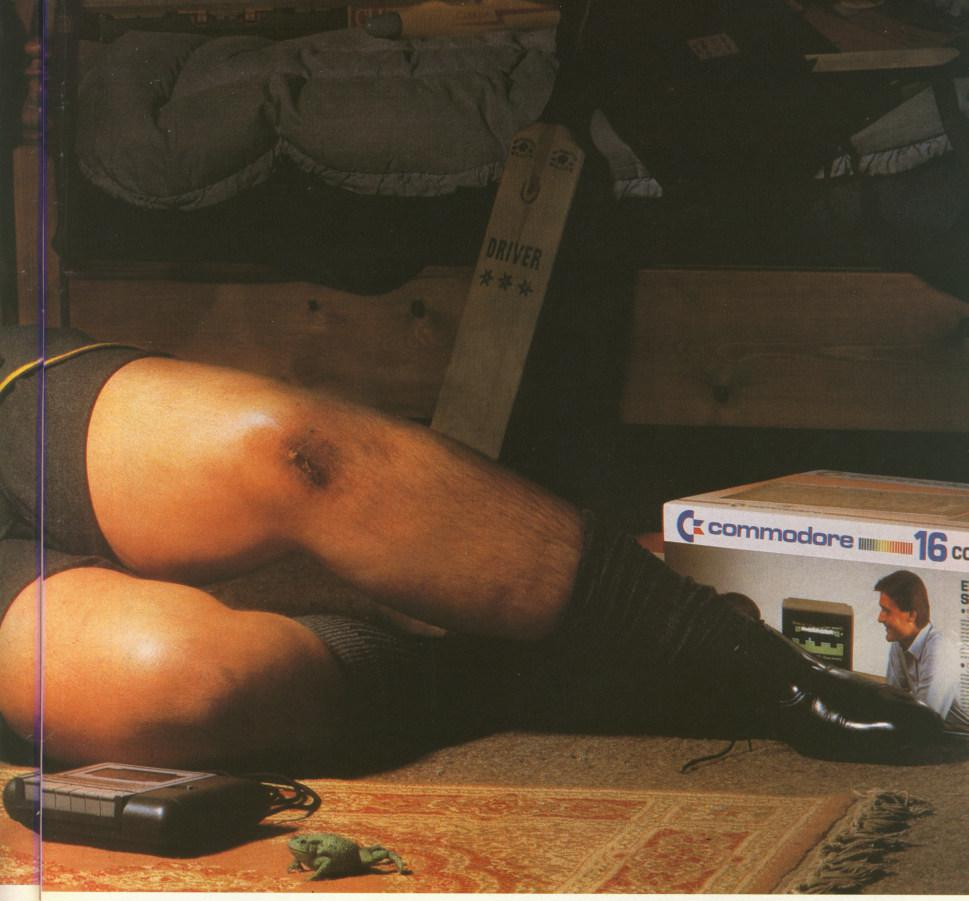

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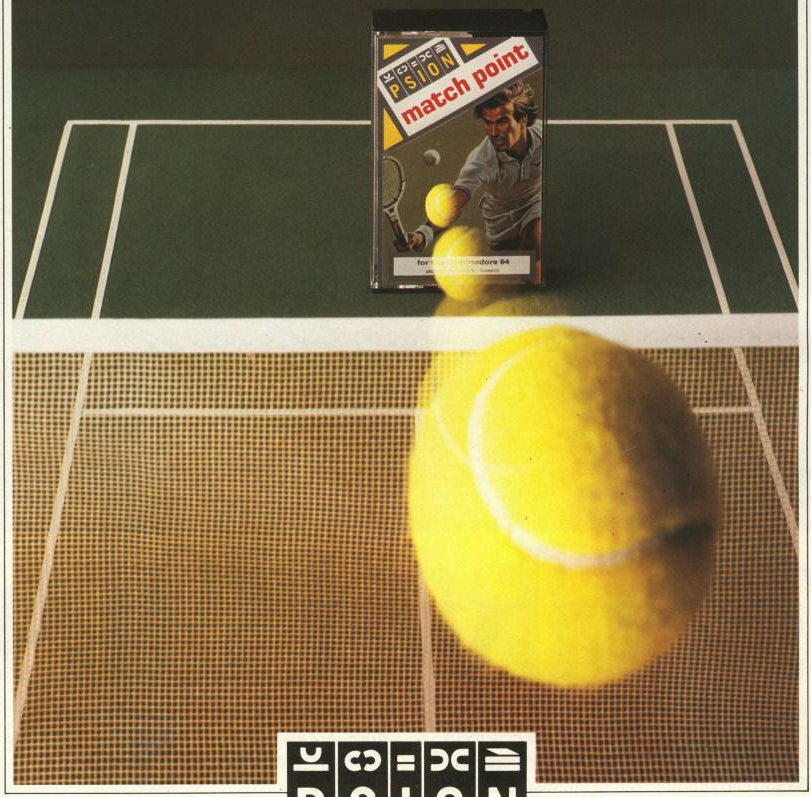

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Pulling the switch on Vic joysticks

Colin Walls explains how to program the switch joystick

WHEN THE Vic 20 was first designed, it was intended primarily as a games machine. While it can be used for other purposes, the Vic is supplied with a selection of features with games in mind. One of the most useful and widely applied is the switch joystick. This is quite cheap, rugged and simple, but provides a versatile means of moving things around the screen.

The switch joystick is comprised of five switches, each of which, when closed, connects an output pin to ground (ie Ov, logic 0). One switch is connected to the "fire" button (often at the end of the stick). The other four switches correspond to the four directions of stick movement: "north", "south", "east" and "west". These four switches may also be operated in pairs, corresponding to the intermediate positions (ie north-east, north-west, south-east and south-west).

On the Vic, the joystick is plugged into the nine pin connector on the side of the machine. The pins are numbered left to right, top to bottom and used thus:

pin 1 — north
pin 2 — south
pin 3 — west
pin 4 — east
pin 5 — pot y (unused)
pin 6 — fire button
pin 7 — +5v (unused)
pin 8 — GND (Ov)
pin 9 — pot x (unused)

Armed with this information, the software described below and a suitable plug (it's called a 9 pin "Cannon D" (female) in the trade), connecting any set of up to five switches to the Vic could not be easier.

Since the joystick is so useful and the hardware so simple, it's a shame that the designers of the Vic didn't make it easier to use from a BASIC program! Everything is OK if you just want to look for north, south, west and fire. These are connected to bits 2, 3, 4 and 5 of port A of VIA # 1. This means that PEEKing 37137 ($9111) gives access to this data.

If you want to detect the joystick in the east position, it's a bit of a problem. This switch is connected to bit 7 of port B of VIA # 2. This would simply be odd and a bit inconvenient, except that this port (all 8 bits) is used for **output** to the keyboard matrix!

To overcome this problem, it's necessary to change the direction of this bit to input (temporarily) by POKEing a 0 into bit 7 of the data direction register (ie put a value of 127 into 37154, $9122), before PEEKing 37152($9120). Don't forget to POKE the direction register back to 255 or you'll find that parts of the keyboard don't work! A side-effect of this rather odd design is that some keys (2, 4 and HOME/CLR) behave oddly when ▶

FIG.1 - SIMPLE BASIC JOYSTICK DRIVING SUBROUTINE

```
1000 POKE37154,127
1010 J=(NOTPEEK(37137)
AND60)OR(NOTPEEK(3
7152)ANDI28)
1020 POKE37154,255
1030 RETURN
```

FIG.2 - SIMPLE MACHINE-CODE JOYSTICK DRIVER, WITH LOADER

```
10 N=0
20 READN$
30 IFN$="**"THEN60
40 N=N+1
50 GOTO20
60 RESTORE
70 A=PEEK(55)+256*PEEK(56)
80 A=A-N
90 AH=A/256:AL=AAND255
100 POKE55,AL:POKE56,AH
110 POKE673,76
120 POKE674,AL:POKE675,AH
130 POKE251,N
140 CLR
150 N=PEEK(251)
160 H$="0123456789ABCDEF"
170 A=PEEK(55)+256*PEEK(56)
180 FORL=ATOA+N-1
190 READN$
200 H=0
210 FORI=1TO16
220 IFRIGHT$(N$,1)=MID$(H$,I,1)THENH=H+I
-1
230 IFLEFT$(N$,1)=MID$(H$,I,1)THENH=H+16
*(I-1)
240 NEXT
250 POKEL,H
260 NEXT
270 NEW
1000 DATAA9,7F,8D,22,91,AD,11,91,49,FF
1010 DATA29,3C,85,FB,AD,20,91,49,FF,29,8
0
1020 DATA05,FB,85,FB,A9,FF,8D,22,91,60,*
*
```

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```
FIG.3 - BACKGROUND JOYSTICK DRIVER (MK.1
), WITH LOADER AND INSTALLER
10 N=0
20 READN$
30 IFN$<>"xx"THEN60
40 N=N+1
50 GOTO20
60 RESTORE
65 N=N-13
70 A=PEEK(55)+256*PEEK(56)
80 A=A-N
90 AH=A/256:AL=AAND255
100 POKE55,AL:POKE56,AH
110 POKE251,N
115 CLR
120 N=PEEK(251)
130 H$="0123456789ABCDEF"
140 FORA=673TO685
150 GOSUB300:POKER,H
160 NEXT
170 A=PEEK(55)+256*PEEK(56)
180 FORL=ATON+N-1
190 GOSUB300
200 POKEL,H
210 NEXT
220 SYS673
230 NEW
300 READN$
310 H=0
320 FORI=1TO16
330 IFRIGHT$(N$,1)=MID$(H$,I,1)THENH=H+I
-1
340 IFLEFT$(N$,1)=MID$(H$,I,1)THENH=H+16
*(I-1)
350 NEXT
360 RETURN
900 DATA78,A5,37,8D,14,03,A5,38,8D,15,03
,58,60
1000 DATAA9,7F,8D,22,91,AD,11,91,49,FF
1010 DATA29,3C,85,FB,AD,20,91,49,FF,29,8
0
1020 DATA85,FB,85,FB,A9,FF,8D,22,91,4C,B
F,EA,xx
```

◀ the joystick is in the east position (try it!).

Figure 1 contains a simple BASIC subroutine to drive the joystick. On return, the variable J contains bits set as follows:

bit 0 — 0
bit 1 — 0
bit 2 — north
bit 3 — south
bit 4 — west
bit 5 — fire
bit 6 — 0
bit 7 — east

Hence, the following values may result:

0 = centre
4 = north
8 = south
16 = west
128 = east
20 = north-west
24 = south-west
132 = north-east
136 = south-east

adding 32 if the fire button is pressed.

The program in Figure 2 loads a machine-code version into the top of memory (any size). This is faster and more compact than BASIC and may be invoked by:

SYS 673 : J = PEEK(251)

It's worth noting that, if you abort the BASIC program (using RUN/STOP), it's possible to end up with a partly disabled keyboard (type RUN/STOP-RESTORE to cure it). With the machine-code version, this can't happen.

Although the above technique does simplify driving of joysticks on the Vic, it still isn't as easy as with some other computers. With the 64, for instance, it's only necessary to PEEK a location to read the joystick position. Can it be made this simple with the Vic?

The answer is "Yes", by implementing a "background" program. Such a program is run every so often, independently of any BASIC program being run at the time. The Vic runs some code every 60th of a second to update the time, scan the keyboard, flash the cursor etc. Fortunately, the Vic operating system is designed such that an alternative program may also be run at that frequency. I have included two variations on this theme.

```
FIG.4 - BACKGROUND JOYSTICK DRIVER (MK.2
), USE LOADER AND INSTALLER FROM FIG.3
1000 DATAA9,7F,8D,22,91,AD,11,91,49,FF
1010 DATA29,3C,85,FB,AD,20,91,49,FF,29,8
0
1020 DATA05,FB,A0,03,91,2D,A9,FF
1030 DATA8D,22,91,4C,BF,EA,xx
```

```
FIG.5 - KEYBOARD EMULATION JOYSTICK DRIV
ER, USE LOADER AND INSTALLER FROM FIG.3
65 N=N-22
140 FORA=673TO694
975 DATA13,91,11,1D,9D,00,00,00,00
1000 DATAA9,7F,8D,22,91,AD,11,91,49,FF
1010 DATA29,3C,85,FB,AD,20,91,49,FF
1020 DATA29,80,05,FB,85,FB,A9,FF,8D,22,9
1
1030 DATAA0,00,A5,FB,29,20,D0,2D,A5,FB
1040 DATAC8,C9,04,F0,26,C8,C9,08,F0,21
1050 DATAC8,C9,80,F0,1C,C8,C9,10,F0,17
1060 DATAC8,C9,84,F0,12,C8,C9,14,F0,0D
1070 DATAC8,C9,88,F0,08,C8,C9,18,F0,03
1080 DATA4C,BF,EA,B9,AE,02,8D,77,02
1090 DATAA9,01,85,C6,4C,BF,EA,xx
```

The program in Figure 3 loads a background program which scans the joystick and places the result (in the form used in the program in Figure 1) in location 251($FB). So, to read the joystick use:

J = PEEK(251)

at any time.

The alternative loaded by the program in Figure 4 places the result in the first variable defined by the BASIC program (which should be an integer). For example:

```
10 J% = 0
20 PRINT J%
30 GOTO 20
```

prints the joystick value continuously on the screen.

The second of the two variations has the advantage of speed, since an integer variable access is faster than a PEEK. In both cases the background program is killed by RUN/STOP-RESTORE. They may be reactivated by SYS 673.

At least one other computer (I won't say which, but suffice it to say that it's not a Commodore) has a joystick interface combined with the keyboard scaning circuitry. This means that the joystick may be driven like the keyboard, ie with GETs.

The program in Figure 5 loads a background routine to achieve a similar effect. The nine values in the DATA statement in line 975 represent the ASCII (ie CHR$) codes corresponding to fire, north, south, east, west, north-east, north-west, south-east and south-west, respectively. The fire button takes precedence over the stick directions. With the given values, the joystick moves the cursor around, using north, south, east and west, by emulating the cursor control keys.

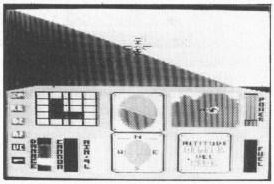
This approach is really my favourite. The main advantage is that programs may easily be written to use the joystick or keyboard with **no** conversions. It would, therefore, be simple to add joystick control to a program written to use the keyboard. Again, the background program may be killed with RUN/STOP-RESTORE and revived with SYS 673.

I mentioned earlier that any five switches could be connected to the Vic using the joystick interface. This is quite a useful technique since a 5v power supply is also available on the same connector. It may be made even more flexible by providing some logic outputs.

This is simple, because the VIA may have its connections configured by software to be inputs or outputs, in any combination. This is only possible with the four connected to VIA # 1, since the other bit is only "borrowed" from the keyboard, when required. The program in Figure 6 cycles all four bits (ie pins 1, 2, 3 and 6 of the connector) between logic 0 and 1, with a period of about a second. ■

```
FIG.6-JOYSTICK 'OUTPUT'
DEMONSTRATION PROGRAM
 10 POKE37139,60
 20 POKE37137,60
 30 FORI=1TO500:NEXTI
 40 POKE37137,0
 50 FORI=1TO500:NEXTI
 60 GOTO20
```

On the wing



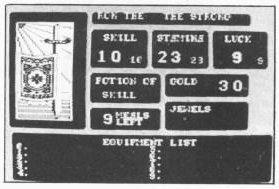
A flight simulator for people who can't stand flight simulators. Having attempted the impossible Sublogic Flight Simulator 2, and ploughed into the ground many a time with Digital Integration's Fighter Pilot, I'm just as relieved as anyone to see a flight simulator stripped of its complexities.

In **Wing Commander** you must pilot your plane to a confrontation with enemy bombers intent on destroying important cilvian and military targets. With the help of a radar map, a cleverly-represented scanner, and various on-screen altitude, condition and warning displays, you can get the baddies in your sights and have the pleasure of blasting them out of the skies.

Not too complex graphically, but a great game to play at Christmas. Really good for younger players, and not bad for old gnarled ones like me.

Program: Wing Commander, 64
Supplier: Creative Sparks
Price: £7.95
Graphics: ★ ★ ★ ★ ★
Sonics: ★ ★ ★ ★ ★
Gameplay: ★ ★ ★ ★ ★ ★

Puffed out?



Puffin's Fighting Fantasy gamebooks have made a fortune for authors Ian Livingstone and Steve Jackson, and have made me very jealous. (I had the idea years ago, but they beat me to it.) You take on the role of a fearless adventurer, and with rolls of a dice and choices selected from a small menu, you make your way through the adventure, either achieving your end or meeting your doom along the way.

The books are excellent, but it is a weakness fo the Puffic software packages that they stick too closely to the same format. This means that you have to wade through reams of text before you come to the point where you have to make a decision, and even when you make a choice all that really happens is that you see a mediocre picture of your assailant and watch simulated dice roll.

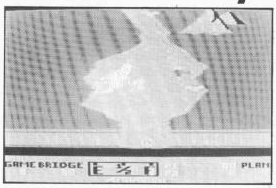
If you've got the books, the software doesn't add much to the fun.

Program: Puffin Fighting Fantasy Software
Supplier: Puffin Books
Price: £5.50 tape, £6.95 with book
Graphics: ★ ★ ★ ★ ★
Sonics: ★ ★
Gameplay: ★ ★ ★ ★

Soft *Hits*

Punishing the pixels and bashing the bytes of all the new games

Carted away



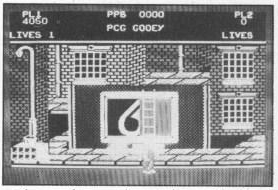
This could have been a good idea, but Activision must get used to the idea that the general standard of computer games should be much higher than that of videocartridges. In this one you pilot a fighter/bomber, seen from above as it makes its way along a narrow valley. Bridges must be knocked out, tanks and enemy fighters avoided or zapped, and various hazards such as balloons and battleships dealt with

You can start at any point in the game, and there are various skill levels. You must destroy or fly over fuel dumps to refuel — a bizarre and illogical game feature, it's always seemd to me — and that's about it.

This is one case where although the game is enjoyable to play, it's despite the graphics and sound, which are rudimentary, rather than because of them.

Program: River Raid, 64
Supplier: Activision
Price: £9.99
Graphics: ★ ★ ★ ★
Sonics: ★ ★ ★ ★
Gameplay: ★ ★ ★ ★ ★ ★ ★

Gnurds



It's a long time since **Taskset** released a game, though they seem to have weathered the long, hard summer well.

Poster Paster isn't their best, but it's still way ahead of many competitors.

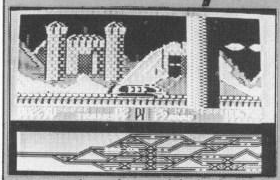
Bill Stickers, Poster Paster extraordinaire, must manoeuvre ladders, posters and gluepot through the streets of — Bridlington? — flicking paste at attacking Gnurds, Wazzocks and Drain Brains. The difficult bit is climbing the ladder and sticking your bits of poster up in the right order. There's a brilliant unscrolling effect as the poster hangs itself, and having achieved one success you have to move on to the next site.

As is usual for Taskset, great graphics, whacky music and a bizarre sense of humour. Watch out for **Seaside Special**, too — it promises to be even better.

(PS — Gnurds look like teapots — or are those the Wazzocks?)

Program: Poster Paster, 64

One-way ticket to doom



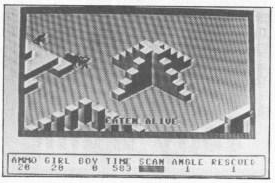
Not much need to explain in depth the deeply wonderful style of the illustrious Tony Crowther, progenitor of **Monty Mole, Potty Pigeon** and **Blagger.** In fact **Suicide Express** is derived from his **Alligata game Loco,** but is ten times better — faster, more violent and graphically stunning.

You guide a futuristic monorail car along a complex of tracks, fighting off attacks from exploding drones, fighter ships and marvellous revolving flying saucers. Incorporating music by Sky, software-generated speech and zippy sound effects, Suicide Express scores tens straight along the line. If you can think of a good reason not to buy this one, I'd jolly well like to hear it.

Program: Suicide Express, 64
Supplier: Gremlin Graphics
Price: £7.95
Graphics: ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
Sonics: ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
Gameplay: ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Supplier: Taskset, 13 High Street, Bridlington
Price: £6.90 on cassette, £9.99 disk
Graphics: ★★★★★★★★
Sonics: ★★★★★★★★
Gameplay: ★★★★★★★

Nest is best



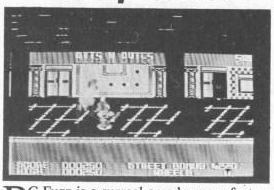
This one was a stunner when it came out on the Spectrum, but like so many other games seems somehow disappointing on the 64.

The 3-D effects are good, depicting a mysterious, ruined city inhabited by marauding ants. You can choose your point of view, switching from one angle to another so that you never lose sight of the protagonists as they roam the city. You can also choose your sex, which is a praiseworthy gimmick from the point of view of the two or three girls who play computer games.

Armed with grenades your explore the city, searching for your beloved and bombing the ants. The Spectrum version of the game contained all sorts of surprises — hidden ammunition caches, secret rooms and so on — whether the 64 version has the same, time alone will tell. Certainly worth having, though not as outstanding now as it might have been had it come out 6 months ago.

Program: Ant Attack, 64
Supplier: Quicksilva
Price: £8.95
Graphics: ★★★★★★★★
Sonics: ★★★★★
Gameplay: ★★★★★★★★

"Ello, 'ello!"

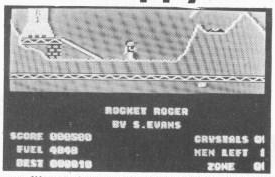


PC Fuzz is a surreal arcade romp featuring a rozzer on a unicycle, flinging guided truncheons at masked robbers planning to spirit away the loot tied to balloons, while punks on pogo sticks bounce through the streets trying to knock our hero off his unicycle, and getaway cars and drunken citizens weave around just to confuse matters further.

If that's the kind of game you like — you'll like this one!

Program: PC Fuzz, 64
Supplier: Anirog
Price: £7.95
Graphics: ★★★★★★
Sonics: ★★★★★★
Gameplay: ★★★★★★

Snappy

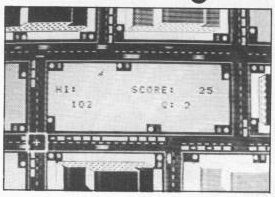


Alligata has been responsible for the lots of good stuff, but having lost Tony Crowther (of great reknown), **Rocket Roger** looks comparatively limp. It isn't though — it's well worth checking out. It's all the usual business — spaceman with jetpack and laser gun, flying through a mysterious landscape avoiding laser beams, sliding doors, flying nasties and invisible force fields. Your aim is to collect fuel crystals to recharge your spaceship, and if you delay too long between crystals you'll take a nasty tumble.

There are 99 crystals to collect, so Rocket Roger should keep a few people busy for the months to come.

Program: Rocket Roger, 64
Supplier: Alligata
Price: £7.95
Graphics: ★★★★★★
Sonics: ★★★★★
Gameplay: ★★★★★★

Green Light



Lovely simple idea; control traffic at a London intersection by using the cursor to select which set of traffic lights to change. Too much of a hold-up at any point and you lose.

Multi-level, nice ragtime music and uncomplicated graphics. probably best for younger children. I'm convinced it's a major contribution to road safety.

Program: Traffic, 64
Supplier: Quicksilva, Palmerston Park House, 13 Palmerston Rd, Southampton
Price: £7.95
Graphics: ★★★★★
Sonics: ★★★★★★
Gameplay: ★★★★★★

Around the horn

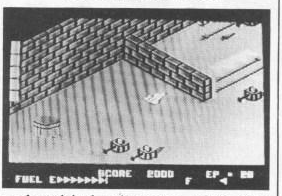
Jumping Jeff strikes again. An Ancipital is a goat-headed homunculoid, derived frm Brian Aldiss' **Helliconia Spring.** In this case your little sprite must negotiate a 10×10 maze inhabited by the usual loony collection of baddies, in search of the six Key Camels and the six Goats of Power. Described as "an adventure for blast-'em-up fiends who hate adventures", **Ancipital** does have more depth than some previous Minter extravaganzas.

There's an enormously complex background sheet included, with a handy little map, and hints on how to cope with the electrified walls, bizarre gravitic effects and various zooming sprites.

This one should be great for Minter fans, though it's unlikely to convert unbelievers, may their armpits be infested with the fleas of a thousand camels.

Program: Ancipital, 64
Supplier: Llamasoft
Price: £7.50
Graphics: ★★★★★★★★
Sonics: ★★★★★★★
Gameplay: ★★★★★★★★

Genuine



The original and genuine, and in many ways a disappointment compared to Dynavision's **Havoc.**

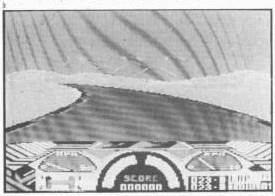
As you will know from countless rip-off versions, **Zaxxon** features a 45 degree perspective scrolling landscape, over which your fighter flies, with full left-right-

up-down control from the joystick. Guided missiles, gun emplacements, force fields, space fighters and rockets attempt to blast you out of the sky as you make your way through ever more difficult obstacles to finally confront the Zaxxon robot. It's all jolly good fun.

Though this version is probably as close as it's possible to get to the original graphically, the sound effects are poor. But if you want the genuine article, this is the one to go for.

Program: Zaxxon, 64
Supplier: US Gold
Price: £9.99
Graphics: ★★★★★★★
Sonics: ★★★★
Gameplay: ★★★★★★★★

Vroom . . .



Limbic Systems, spin-off from financially-embarrassed Oxford Computer Systems. **Turbo 64,** car race game similar to Atari's **Pole Position,** only no other cars on track. Software protection system, very annoying. Requires you to hit joystick at right time when screen displaying certain colour checked against special numbered grid on insert. Nice sound effects in the intro sequence, which seems to go on for ever. Not much else to say really.

Program: Turbo 64
Supplier: Limbic
Price: T.B.A.
Graphics: ★★★★★★★★★
Sonics: ★★★★★★
Gameplay: ★★★★

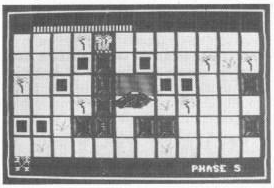
Magic!

Virgin's corporate socks have certainly been pulled up. This latest offering, though hardly stunningly original, is fast, whacky and very polished. As the last surviving magician fighting the evil necromancer, you must roam the land collecting various weapons, spell books and potions before confronting the baddie at Stonehenge. Energy, location and inventory are given at the bottom of the screen.

Some colourful graphics as you negotiate the 17 screens, super spooky music and sound effects, and an important element of strategy which makes Sorcery much more than just another multi-screen arcade game.

Program: Sorcery, 64
Supplier: Virgin
Price: £6.95
Graphics: ★★★★★★★★
Sonics: ★★★★★★★★
Gameplay: ★★★★★★★★

Ugh! slug bugs



Adapted out of all possibility of recognition from an Atari original, **Java Jim** should give a few players late nights.

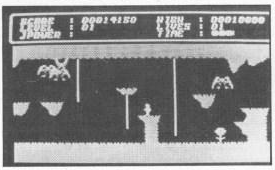
Although it's basically simple — a jungle explorer hopping around a grid of squares, uncovering treasures and avoiding voodoo creatures — it's the little details that make this game so satisfyingly complex.

Collecting treasures allows Jim to trade for pieces of a magic boat, and it's the compulsion to complete this vessel that gives the game its playability.

What with snake pits to negotiate, Slug Bugs to avoid and black holes to fall into, Java Jim's got the lot. Give it a try.

Program: Java Jim, 64
Supplier: Creative Sparks
Price: £7.95
Graphics: ★★★★★★★
Sonics: ★★★★★★★
Gameplay: ★★★★★★★

Cave man



The latest from Bubble Bus is not overwhelmingly original, but features a few good baddies (if you see what I mean) and nice title music (Chariots of Fire).

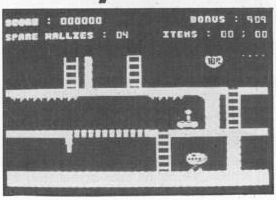
There are 31 screens to explore, and it's the usual business of climbing ropes, zapping man-eating plants and flying goolies, and sticking within the time limit for each cave.

Laudably, the number of lives you start with can be set from 1 to 99, and you can start at any cave at a variety of skill levels.

Not a classic, but well worth checking out for those of you who like a game which certainly can't be defeated in a single sitting.

Program: Cave Fighter, 64
Supplier: Bubble Bus
Price: TBA
Graphics: ★★★★★
Sonics: ★★★★★
Gameplay: ★★★★★

Jolly Wallie



Yet another of the Manic Mole/Miner Wally/Jet Set Blagger stable, but an excellent game for all that. Trollie Wallie, who looks like a carnivorous Jaffa orange on legs, leaps around a whacky supermarket collecting goodies and avoiding goolies. Every five items he must go back to the checkout to unload.

Hidden levers open doors and vicious weeblies flop around menacingly. Best of all, though, there is a great music score featuring *Popcorn* and *Jean-Michel Jarre*'s greatest hits.

Good scrolling and a large playing area. A must if this sort of game is your bag, or if you like good soundtracks.

Program: Trollie Wallie, 64
Supplier: Interceptor, Lindon House, The Green, Tadley, Hants
Price: £7 cass, £9 disk
Graphics: ★★★★★★★★
Sonics: ★★★★★★★★
Gameplay: ★★★★★★★★

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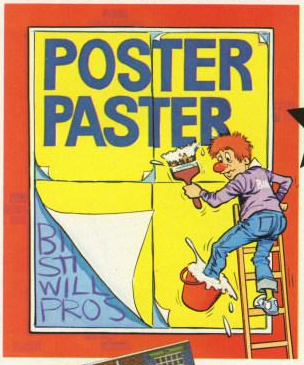

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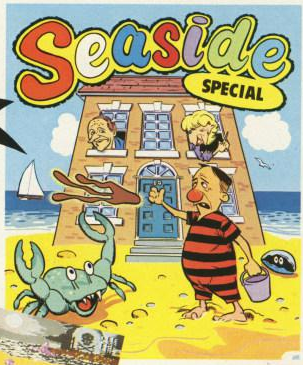

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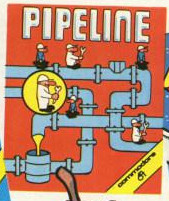

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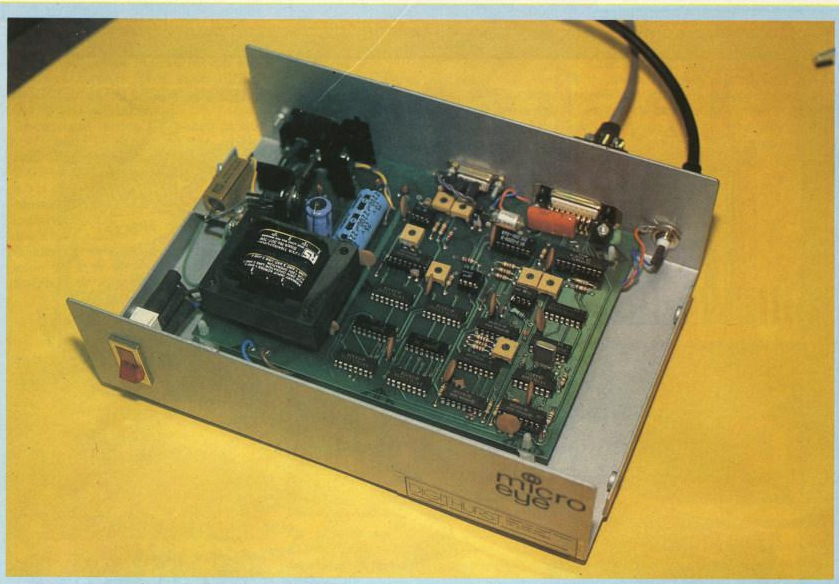

Splitting Images

VIDEO DIGITIZING systems, which allow the output of a video camera to be transferred to a computer screen, have been around for many years now, but mainly in the guise of research projects or very up-market graphics systems. Digithurst has now produced a version of its Microsight 1 system which interfaces with the Commodore 64, and which (depending on your affluence), is within reach of home users as well as professionals. The digitizer costs £500, but if you have your own camera, you can expect to knock £150 off the price.

The system supplied for review consisted of a video camera and tripod, the interface box, connecting leads, manual and software. The camera is a black and white ITC Ikegami 40 model. If the name of the manufacturer is unfamiliar to you, then it is worth mentioning that many broadcast organisations use Ikegami hand-held cameras, affectionately known as "Ikkies". The model 40 is at the other end of the range, however.

It contains a Vidicon picture tube and is fitted with an f1.4 lens with a minimum focusing distance of 18 inches. The electronics handle the signal levels, so in order to obtain the best contrast range, it is only necessary to adjust the iris. Although this sounds like an advantage, it would help if gain and black level were adjustable. The connections to the camera are a mains supply and video lead — a BNC-type socket feeds the interface via a supplied lead.

The sturdy aluminium box containing the interface electronics, called Microeye, measures 10 by 7 by 3 inches and has one external control — which is only a power switch. A D-type socket carries digital signals to and from the box, and mains must be supplied via the Europlug connector. Inside the box the quality of construction is high, with all but one power supply resistor mounted on a double-sided circuit board. The majority of the active components are TTL chips, but at the heart of the interface is an analogue to digital converter IC.

Connecting the interface to the CBM 64 is achieved with a cable that plugs into the user port. But, the lead provided with the review package could be plugged into the computer upside down, as no polarising keys were fitted. On a prototype system this is forgivable, and it will only cost a few pence to correct.

Describing the manual and software that will come with production systems is difficult, since we were provided with pre-production copies. The prototype software was supplied on disk, but production software will be provided on cassette, with the facility for making disk copies. The manual consists of 50-odd pages housed in an A4 folder, but mine related to an earlier system for the PET, with a few pages referring to the 64 version. If the final result is as comprehensive as the PET manual then it will be quite adequate, though not designed for inexperienced computer users.

The way that the system works is both interesting and clever. For readers who are not clear about the make up of a video picture, I will give a brief summary, as this is required knowledge if you want to understand how the Microeye functions. The signal produced by a video camera is a series of lines of picture information interspersed with negative-going synchronising pulses. First comes a long pulse that indicates the start of a new field, then a line pulse signals the beginning of each line of video brightness information.

Commencing top left, the image is built up a line at a time from this data. Each line takes 64 microseconds to scan and 287 (and a half, but lets forget about that!)

lines to build up one field, which takes a fiftieth of a second including the field pulse. A second field is required to make up a full video frame. The line information comes from between the first set of lines, this method being called interlacing.

When the Microeye interface receives a reset signal it waits for the beginning of the next frame. When this arrives the A/D converter is fed the brightness level of the beginning of the first line of the picture. This is converted to a parallel digital signal that is then passed to the user port of the computer, where software handles the information, storing it for later use. Note that up to 8-bit data is available, giving 256 discrete levels, but only four bits are stored by the computer, resulting in 16 different levels. One dot of picture has been stored, but this takes time, and by now the video signal is giving values from much further along the line. The interface therefore waits for the next line pulse and repeats the process on the first dot of the second line, then the third, fourth and so on. Finally, 256 dots having being stored, the rest of the field is ignored.

When the next field arrives, (which is vertically misplaced because of interlacing, but close enough for these purposes) dots are examined and stored in the same manner as before. The only difference is that the sample of video brightness is taken from a little further along the line.

After the second field has been digitised, therefore, the computer has two adjacent rows of dot data stored, corresponding to the first two left-hand pixels from each line. The saga continues — each field is processed until a full width picture has been stored, consisting of 256 by 256 pixels, each recorded to 4-bit accuracy.

Limited resolution

It is at this point that I must admit to misleading you. The description of the interface does not take into account the limited resolution of the 64. "What?" I hear you cry. "The 64 has a very high resolution." I agree, but not quite enough to handle 256 lines and include some form of grey scaling. The software for the 64 version discards alternative pixels and ignores some at the bottom, giving 100 pixels vertically, and also does not bother with every other field, so the horizontal resolution is 128.

So much for the theory, how well does it work in practice? With a few reservations, the answer is "very well". Once I had hooked the system up to the computer, I loaded the software from disk. The first step is to load and run an initialization program. This pokes a good deal of machine code into place and then asks if you have a disc or tape system. Once you reply, the second program automatically loads from the correct source and auto-runs.

After another delay, for more machine code installation, the 64 switches to the high-res mode and clears the screen. You now need to refer to the instructions again as no prompts appear on the screen, but operating the software only involves the function keys.

F1 reads in an image from the interface. The VIC chip is switched off, so that the CPU is not slowed down and timings are more accurate. For five seconds you are presented with a blank screen, while the data is gathered, and then a 128 by 100 picture is drawn in the bottom left hand corner of the screen. This is a binary image, with no grey scaling, and only takes a few moments to produce.

It is at this point that I realized that adjusting the camera was going to be a rather long-winded task. So, to speed things up, I looped the video output through the auxillary input of a VCR, allowing me to view the camera image on a TV and adjust it quickly. Once a well exposed, recognisable picture was coming from the camera, the results of pressing F1 were more encouraging. The image data is only read in by this one function, and is stored in a 12K table.

It is this stored picture that is displayed by pressing F3 — the mode for reproducing a larger, shaded display. The display is not the full screen width, as the 128 pixels are doubled in width, and that leaves 64 of the computer's 320 available pixels with nothing to do.

First results of using F3 were impressive, but could be improved with the aid of the third function, F5. This allows the user to adjust two variables used to produce the image. Threshold can have any value between 0 and 255 and affects the overall density of the picture. Increasing this value gives a darker image. Contrast affects the spacing between shades of grey, and can have a value between 0 and 32. Pressing F5 returns you to the text display, where the computer prompts you for new values.

At this point a bug in the software raised its ugly head. Even when inputting what I thought were valid values, the software occasionally stopped with an "Illegal Quantity" error message. This would not have been too disastrous if I had been able to restart the program, but some of the machine code must have been corrupted by the error, so each time the bug appeared I ended up reloading the program. Digithurst points out that the software is still in the prototype stage, so I'm sure this will be sorted out.

When the values are accepted, you are given a quarter screen view of the effect of changing Threshold, and F3 will then display the image using the new variables.

The final function, F7, will output the large picture to an Epson-type printer using bit-density graphics. Without the correct printer, I was unable to check the results. This is the only way, apart for photography, of preserving your masterpiece at present. I am assured that the final version of the software will include a tape and disk save and recall function, and that it will also be possible to "export" the image to one of the graphics handling packages for further improvements.

Lighting problems

Problems? Lighting 3-D objects so that they are very evenly illuminated and have a narrow contrast range requires time to experiment. With a stored contrast range of 16 to 1 and a displayed range of 4 to 1 much experiment was involved in bringing out details. Two-dimensional images were fairly easy to store if you only want two-tone results, but if grey-scaling is desired then careful selections of subject matter is necessary.

A secondary problem was caused by the camera supplied, which suffered from shading in the corners. The system does not sample the whole frame — the bottom of the frame must be omitted because there are too many lines in a standard video signal, and the width must be curtailed accordingly to maintain the correct aspect ratio. The upshot of this is that the camera shading in the top left corner is accentuated, and often proved impossible to "light-out".

Another piece of software that will also be available with the system uses the multi-coloured bit-mapped mode of the Commodore 64. Therefore, colours will replace the bit-density method of reproduction, with the choice being left to the user. In fact, the software situation is really a question of demand. If you are unable to change what is supplied to meet your exact needs then Digithurst may well be able to help.

One experiment which I tried was taking a still frame from a video recorder. My particular machine does not provide a very stable freeze frame, and yet the results were passable.

The hardware part of the system presents some very exciting possibilities. With the right software, Microsight will be able to carry out many practical tasks, and home users (with sufficient money!) will find the system a fascinating and absorbing addition to their Commodore 64. ■

Jeff Naylor

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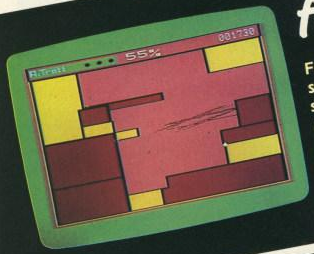

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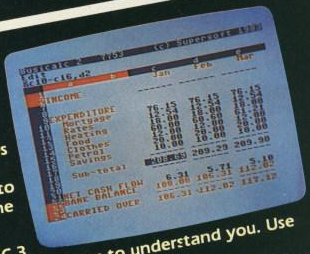

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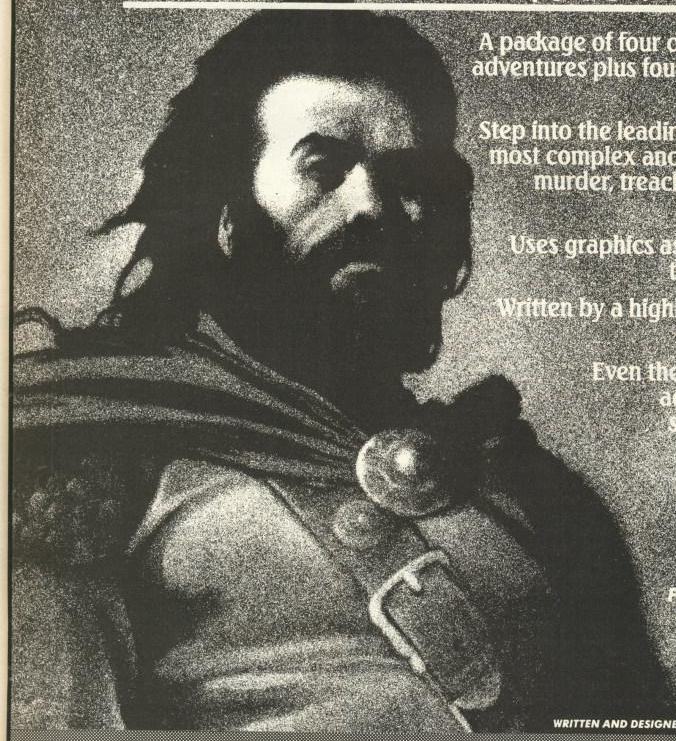

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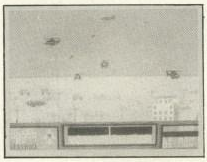
***Chris Jenkins** interviews Steve Lee, author of Falcon Patrol*

WHEN WE talked to Steve Lee in luxurious Sunshine Towers he was going through a period of enforced idleness.

"I've just moved house, and the builders are still working on the estate. Every time they rev up their diggers all the fuses blow, so at the moment my 64's out of action. I'm spending the time fishing!"

In fact, Steve finds that working as a full-time games programmer has its ups and downs. "The neighbours can't make me out — I get some very funny looks when I tell them what I do. They assume because I'm around the house all day that I'm just idle."

It was another period of enforced idleness which encouraged Steve to become a programmer in the first place. "I had a computer science A level — the only one of three that I was any good at — and my earliest experience with computing was using a ZX81. I later moved on to the Vic 20, and started writing games because I was interested in graphics. Unfortunately, I was made redundant, so with nothing better to do I tried selling some games . . . the first was **Tornado**, to Quicksilva."



Steve's early efforts **Tornado** and **Skyhawk** were written using the Vicmon cartridge, without the benefit of a printer or disk drive. "Everything was written down on paper," Steve recalls, "but I was very pleased with the results. My next game, **Mission Mercury**, included a "sprite" routine on the unexpanded Vic. That's its main claim to fame. It was very much a version of **Lunar Rescue** — all the games house had one — and Virgin offered me a contract based on it. By that time I'd got hold of a 64, one of the first in the country, and I was learning how to use it, which was hard work because I didn't have full documentation. But working that way I got to know the machine very well!"

Steve's first 64 game, **Falcon Patrol**, became an instant classic, and set a precedent for Virgin Games — people actually liked it. "When Virgin went into the games business people accused them of hyping their products, because they were a record company. I don't think it was ever that bad, and in any case the situation's quite different now — if you look at the ads you'll see that they're purely descriptive, none of this 'mega-game' and 'synergy' stuff.

Falcon Patrol was shown with great success at the American Consumer Electronics Show, and went on to become one of Virgin's best sellers. "In fact, although I haven't made a fortune from programming, **Falcon Patrol** did finance my move to the new house. Now that Virgin have cut the price to £2.99, they're selling huge quantities mail order, and I get the same payment from a £2.99 mail order sale as I would from a £6.95 shop sale."

Falcon Patrol is arguably a **Defender** variant, but there are crucial differences. Firstly, the background is so detailed that the game is worth seeing just to watch it scroll by. Secondly, there is a certain amount of strategy involved in using your radar display to creep behind the enemy fighters and blast them before they can blast you; then in landing to refuel and re-arm before the next wave comes along. "I wouldn't write a straight shoot-'em-up without an element of strategy", says Steve, "it just wouldn't interest me."

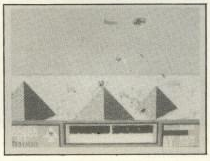
If there was a problem with FP1, it was that you can stooge around chasing enemy fighters for long minutes without catching them, just running out of fuel and watching the landscape scroll by. However, in incorporating the sideways scroll techniques from **Tornado**, and the attention to detail born of Steve's interest in graphics, **Falcon Patrol** made a big hit. Virgin considered ideas for a sequel immediately, but Steve's next effort was on an entirely different track.

"I wanted to do a maze game, but I also wanted to add an element of humour to offset the violence! So I came up with **Hideous Bill and the Gi-Gants.**"

Hideous Bill is a sort of anti-hero version of Indiana Jones. "In another context he could be a wally," says Steve, "but I like him. I might even use him in another game. In fact he's based on a mythical character from my youth. A bunch of my friends had T-shirts printed up with 'Hideous Bill Lee' and so on — we were all Hideous Bills. I had been playing around with a sprite editor package, and came up with the image of an ant. It was just one of lots of ideas — I'd like to do something involving skeletons — but it was the basis of Hideous Bill."

Hideous Bill's history is well-documented in the game's insert, written by Steve's brother. In this adventure his mission is to rescue his beloved Greta from the clutches of the Gi-Gants. In the first screen he had to circumnavigate a maze, smashing eggs and avoiding the ants. In the second there are hidden levers which must be picked up in order to open the door to the next level, and a can of baked beans which restores Bill's strength. The third screen is a spiral which Bill must traverse by knocking holes in the wall with his head, so that he can take refuge from the marauding ants. Should he rescue Greta, there's a three-minute cartoon sequence which ends with the unfortunate girl being kidnapped again, and the whole thing restarts. Hideous Bill, hero of the game Steve has written for this month's issue of *Commodore Horizons,* may return in Steve's next game, but for the moment let's leave him to the ants.

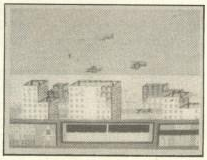
Steve's latest production is **Falcon Patrol 2.** "We thought for a long time about how we could do a sequel. I designed the background, which was substantially the same as the original, but with more detail. Then one of the other programmers on Virgin's team looked at it and enlarged the scale of some of the buildings, and added the pyramids . . . it now looks quite different to my original design. I now have things like the title screen and the high-score screen worked out, so there wasn't much effort required on that side of things. My brother Dave wrote the music. We use a



TEAC Portastudio and a **Korg Mono/Poly** to work out the tunes, then I use **Synthi 64** and a routine I've written myself to dump the music data into my program. One thing you've got to say about the 64 is that the sounds are better than the graphics,

although the filters on the SID chip can be a bit unreliable."

A lot of work on **Falcon Patrol 2** went into the sprites. "I didn't use bit-map mode because it uses up a lot of memory. The



background is all user-defined graphics, and the helicopters and flak are sprites. You'll notice that the flak batteries sometimes stop firing when the helicopters appear — this is because I've stolen the sprites. Games like **Revenge of the Mutant Camels** use only eight sprites, though it looks like there are more. I experimented with routines to create more sprites — you could have 255 quite easily, but due to the interrupt structure they could only move horizontally. This would be all right for a game like **Frogger**, but not much good in something like **Falcon Patrol**.

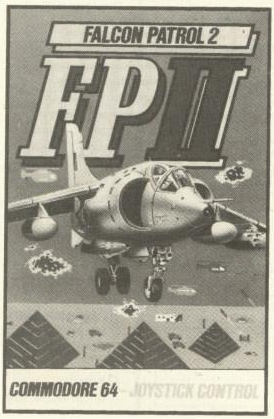
"I tried to write a routine which would use 16 sprites, using just the standard eight but turning them on and off with the interrupts. It didn't work out because the results were too flickery. On the Spectrum you can define any number of "sprites" you like, but the problem with the machine is the colour clashes.

"Another idea I experimented with on FP2 was tanks on the ground, but the spective requirements with the sprite priorities made it all too complicated. I'd rather take a few ideas to their limit than try to cram in too many, so I just used the ground-based flak batteries and radar jammers.

"The tactics for FP2 are quite different to those in FP1; you can't just come up on the enemy from behind. The helicopters move more randomly. In fact there are 32 variables between levels — some of them are quite subtle, others more obvious, like the height at which the flak batteries can hit you. At levels 8 and 9 there's a lot more flak — you can just about ignore it in the early levels.

"I'm not much of a games player — the highest score I've got on FP2 is 4000. I'm just not motivated I suppose.

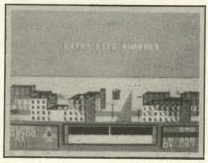
"My brother Robert designed the aircraft in FP2, and the way it banks and turns. Since I don't see many other games it's a great help to have the opinions of my brothers and the other Virgin programmers — they see and play everything going. I like a few games — I bought a Spectrum just to play **Fighter Pilot**, and I like **International Soccer** and some of Jeff Minter's games on the 64. But I couldn't write something like Virgin's Spectrum game **StrangeLoop** — it just wouldn't hold my interest screen after screen. I've got lots of ideas, though, that might be suitable for one of the Virgin programmers — something about lumberjacks trying to keep the logs from blocking the stream, or another idea I had was a steam engine simulator, just like a flight simulator only with a firebox and brakes and so on."



Though Steve's seen the new Commodore machines, he doesn't regard them as games playing micros. "I use my 64 for some business applications; Paperclip helps me to do word processing, and even accounts and spreadsheet work. The Plus/4 might do a good applications machine, but Commodore might do better off dropping the price of the 64. They'll certainly have to consider doing that in the case of the C16, if it's to compete with the Spectrum. The 64 would be just right if the price was a little lower, and if it had better colour resolution. I think ideas like speech synthesis hardware are basically good, but they need a user base before the software houses will take it up. Speech software is good in principle, but you need around 3K per second for reasonably intelligible results — the memory just isn't there.

"I wouldn't break into a game to look at how it's written — firstly there aren't that many I'm interested in, secondly I don't like the idea. I think it's the originality of the concept that makes all the difference. That's why my next game is going to be really unusual — no zapping, no simple single quest, the aim isn't even just to amass points. There are going to be seven or eight characters, one of which the player will control. There's an interactive element, with the other characters trying to stop or help you as you do the job you've set out to do. I think I'll be able to use 40 or 50 screens with a reasonable amount of detail, using some elements repeatedly in different combinations. The main feature is going to be the graphic effects, with zooms and dissolves like in a film. I don't know what you'd call it — it's neither an arcade game nor an adventure — it's probably not even a game as such!

"I work when the mood takes me, sometimes for up to 12 hours at a time. If I don't feel like working I get overwhelmed by guilt eventually and I get back down to it, but it's no good trying to force an idea — something always turns up if I give it long enough.



"Hideous Bill might be the hero of the new game, or maybe not — we'll have to see how it goes. Working with the Virgin team there are always new ideas coming from all directions." ■

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New users – start here!

If Santa brought you a Commodore 64 or a Vic 20, you might find yourself sitting in front of your TV watching the cursor flashing, with no idea what to do next. ***Sarah Cotton*** *explains the basics of Basic, and sets you on the road to programming success*

IF YOU are baffled by your Vic-20 or Commodore 64 then this article should be of some assistance. It covers several basic principles of using your computer in an easy to understand way.

When you turn on your computer you will see a blinking square on the screen. This is the CURSOR, which tells you where the next letter will be printed. You can move it about the screen using the keys in the bottom right-hand corner of the keyboard marked CRSR. The left-hand one will make the cursor move directly downwards, but if it is used in conjunction with one of the shift keys the cursor moves up. The right-hand key controls horizontal movement and again can be used with the shift key.

You can easily change the colour of the cursor. If you type in a few letters you can will see that they appear in the same colour as the cursor. To change colour hold down the CTRL key along with one of the numeric keys. You will notice that the first three letters of the colour are shown on the vertical sections of the keys; BLK = black, PUR = purple, WHT = white, GRN = green, RED = red, BLU = blue, CYN = cyan (light blue), YEL = yellow.

The Commodore 64 also has 8 additional colours, which can be accessed using the Commofore logo key at the bottom left-hand corner instead of CTRL.

Cursor

As well as changing the cursor, you can also alter the colour of the screen and border. For the Vic-20 type the following and then hit the RETURN key:

POKE 36879,8. That will give you a completely black screen. Other combinations can be found on page 134 of the supplied manual. On the Commodore 64 you will need to type two lines, each followed by the RETURN key. Firstly type this:

POKE 52380,0

That will give you a black border. Now try this:

POKE 53281,0

The numbers of the other colours are on page 61 of the users guide.

For both computers you can get back to the original colour by holding down the RUN/STOP and RESTORE keys together.

Try typing in words and graphics until the screen is full. On the vertical faces of most of the keys you will see the "PET graphic characters". To obtain those on the left, use the Commodore log key, and for those on the right employ one of the shift keys. If the screen gets a bit cluttered up hold down the CLR/HOME key and shift simultaneously. Without the shift key this will return the cursor to the top left-hand corner.

Make sure that you know where the RETURN key is, as you will be using it a lot in the future. It is employed to enter instructions or information.

To get your computer to work you will need to write a 'PROGRAM' which is really just a set of instructions. The▶

Program 1

```
10 PRINT"HELLO"
20 GOTO10
```

Program 2

```
10 PRINT"HELLO"
20 PRINT12
30 PRINT12*3
40 PRINT12/3
50 PRINT3↑3
60 PRINT3+3
70 PRINT3-3
80 PRINT12;3
90 PRINT12,3
100 PRINT"SWORD"+"FISH"
110 PRINT"SWORD";"FISH"
120 PRINT"DAY","NIGHT"
130 PRINT"3+3"
```

Table 1

SIGN	FUNCTION
+	ADDITION
-	SUBTRACTION
*	MULTIPLICATION
↑	EXPONENTIATION (TO THE POWER OF)

Program 3

```
10 PRINT"
```

◀ program is divided into lines, each with its own individual number. When the computer is asked to start the program working it begins at the line with the lowest number and then systematically follows through. Type in program one, remembering to hit RETURN after each line. The quotation marks ('') can be obtained using the keys 'shift' and '2'. If you make any mistakes then you can use the INST/DEL key to erase any previous characters.

Nothing will actually happen yet — the computer has just stored up the program in its memory. You can check this by typing LIST followed by the RETURN key. This will display the program lines in numerical order regardless of the order they were typed in. When you are ready to get the program working type RUN, but don't forget that RETURN key. If you have any difficulties with the program not working check that it is absolutely correct. Any lines which are not right can be re-typed. When you get fed up press the RUN/STOP key.

Commands

Now let us see how the program was constructed. The lines are numbered 10 and 20 so that there are plenty of gaps in between to add extra commands. For example, we would add another line labelled 5 or 17. It doesn't matter how the lines are numbered, so long as the line numbers correspond to the order the program is to be worked.

Line 10 prints or displays on the screen the letters within the quotation marks. You could change the word 'HELLO' to anything else by re-typing the line. Try this and use 'LIST' to check that the computer has noted your alteration. Adding a semi-colon (;) after the final quotation mark will produce an interesting effect.

Line 20 tells the computer to go back to line 10 and begin again.

You can erase any line by typing the appropriate line number followed by the RETURN key. Try removing line 20 in our original program.

If you want to get rid of an entire program use the command 'NEW' followed by the RETURN key. This should always be used with care — once your program has been erased it cannot be retrieved. Always remember to use the 'NEW' command before entering any program from this article to erase any previous program.

Try program two. Remember to use NEW, the RETURN key and RUN to get everything working properly.

Compare the results obtained to the program itself and you will see the different ways in which the print statement works. Take note of the different mathematical functions in table 1.

You have already seen how to move the cursor and change its colour. Now let us build these ideas into a program which will print the word 'HELLO' in black 3 spaces down the screen and 9 spaces in. Start by typing program 3.

After the quotation mark press CTRL and 1. You will see a little square appear

Program 4

```
10 LET T=6
```

Program 5

```
20 LET T=T+6
```

Program 6

```
15 PRINT T
25 PRINT T
```

Program 7

```
10 LET A$="HELLO"
20 PRINTA$
30 GOTO20
```

Program 8

```
10 A$="HELLO"
```

Table 2

SYMBOL	MEANING
<	LESS THAN
>	GREATER THAN
=	EQUAL TO
<>	NOT EQUAL TO
>=	GREATER THAN OR EQUAL TO
<=	LESS THAN OR EQUAL TO

Program 9

```
10 T=0
20 PRINT"HELLO"
30 T=T+1
40 IFT>2THENSTOP
50 GOTO20
```

on the screen which is called a 'control character'. It tells the computer to change the colour within the program and not directly as we have done before. Follow this with 3 presses of the cursor down key, 9 presses of the cursor right key, the word 'HELLO' and finally a quotation mark. Hit RETURN and RUN the program.

Variables can be thought of as little boxes within your computer which can hold information. The box is given a name so it can be refered to later. For the moment you will be meeting 2 types; firstly variables with names consisting of 1 letter, 2 letters or a letter and a number, for example A, TT, F1. Each of these 'boxes' can only hold one number. If we want to put the number 6 in a variable called T this is what we type: (see program 4).

Try this short program out. Now let's add 6 to the variable, as shown in program 5.

If . . . Then

You will notice that when the print command is used in conjunction with a variable no quotation marks are required. The way we have built up this short program also illustrates the importance of leaving plenty of gaps between the line numbers.

The second type of variable such as A$, AA$. A1$ consists of letters or letters and numbers followed by a dollar sign. These can hold strings/groups of letters and numbers but the numbers cannot directly be used in mathematical calculations. Try program 7. You should be familiar with all the commands included.

Up till now we have been using the LET statement to put something into a variable, but it is not really necessary. Thus we could change line 10 in our last program to that in program 8.

Before we see another program using variables let's learn a little about IF... THEN statements. They can be used in conjunction with variables to set up conditions within programs in the form of 'IF something happens THEN do something else.' Refer to table 2.

Now let's try program 9. When it is run 3 HELLO's will be printed on the screen. 'T' is the name given to the variable which means that it can only hold a number.

For . . . Next

Line 10 makes sure that T is set at 0 and each time HELLO is printed the number held in the box is increased by 1. Line 40 checks to see if T is greater than 2 and if it is it automatically stops the program. Otherwise it continues to line 50.

In the last program we were able to control the number of times an operation was completed. Although the program worked well there is a tidier and shorter way of arriving at the same result. Try program 10 which employs a FOR... NEXT loop.

This time you only need 3 short lines. I have chosen the variable T again so that you can easily compared this program with our last one.

The computer begins at line 10, setting T at 1. HELLO is printed and the ▶

Program 10

```
10 FORT=1TO3
20 PRINT"HELLO"
30 NEXTT
```

Program 11

```
10 PRINT"HELLO"
20 FORT=1TO1000:NEXT
30 PRINT"GOODBYE"
```

Program 12

```
10 FORT=1TO88STEP22
20 PRINT"HELLO"
30 NEXTT
```

Program 13

```
10 FORX=10TO0STEP-1
20 PRINTX
30 NEXTX
```

Program 14

```
10 FORT=1TO10
20 FORX=1TO5
30 PRINT"HELLO"
40 NEXTT
50 NEXTX
```

Program 15 — Vic 20

```
10 FORX=12TO15
20 FORT=128TO255
30 POKE36878,X
40 POKE36876,T
50 NEXTT
60 NEXTX
70 POKE36876,0
80 FORX=15TO12STEP-1
90 FORT=255TO128STEP-1
100 POKE36878,X
110 POKE36876,T
120 NEXTT
130 NEXTX
140 POKE36878,0
150 POKE36876,0
```

◀ NEXT statement sends the computer back to line 10. T is increased to 2 and the process begins again.

When T is 3 and the final HELLO has been printed the NEXT statement sends the computer back to line 10 where T becomes 4. As it is now out of its limits, the program jumps to the line after the NEXT statement or, if there are no more lines, finishes.

Loops

It is often useful to stop a program in the middle of running it for a short time, for example to give a user time to read some instructions. See program 11.

Line 20 creates the delay. The program sticks here until T reaches 1000. You will also notice that there is more than one command on this line, each separated by a colon (:).

So far the variables in any of the FOR...NEXT loops have only increased by 1 each time. This can be altered as in program 12.

This time the variable increased by 22 each time and HELLO was printed 5 and not 88 times. It is also possible to have negative steps as in program 13.

At first sight program 14 might appear perfectly correct, but in fact the loops have been incorrectly 'nested'. The T loops was created first, so its NEXT statement should come last. Therefore lines 40 and 50 need to be exchanged. Once corrected the program will print the word HELLO 50 times. The X loop prints HELLO 5 times and the T loop repeats this a further 10 times.

The nesting of loops is a technique frequently required when making sound effects. Even if you don't yet know how to use your computer's sound facility try the appropriate program, 15(a) for the Vic-20 or 15(b) for the Commodore 64.

The INPUT command is used to obtain information in the form of letters or numbers from the program user. Try program 16.

REMarks

When a question mark appears answer the question and then press RETURN. The variable A$ holds your name and T your age. You can then use this string variable information in later stages of your program.

REM statements do not effect the way in which programs work. They allow the programmer to add notes around the program to explain its workings, etc. For example, see program 17.

When typing in a program from a book or magazine the REM statements can be omitted so long as you're not removing lines which are referred to elsewhere in the program.

Now that you have worked your way through this article, let's end with a final program (18) which includes several of the principles you have learned about.

You should now have mastered many of the most essential principles of programming in Commodore Basic, and be ready to incorporate them in your own programs. ■

Program 15b — CBM 64

```
5 FORX=1TO3
10 POKE54296,15
20 POKE54277,10
30 POKE54278,0
50 FORV=15TO0STEP-1
60 FORLP=100TO101
65 POKE54276,65
67 POKE54296,V
70 POKE54275,10
80 POKE54274,LP
90 POKE54273,24
100 POKE54272,63
105 POKE54276,0
110 NEXTLP
120 NEXTV
130 NEXTX
```

Program 16

```
5 PRINT"WHAT IS YOUR"
10 INPUT"NAME";A$
20 PRINT"HELLO ";A$;"!!!"
30 INPUT"HOW OLD ARE YOU";T
40 PRINT"NOW I KNOW THAT ";A$;" IS ";T;
"YEARS OLD."
```

Program 17

```
10 REM HELLO PROGRAM
20 REM BY SARAH COTTON
30 PRINT"HELLO";REM PRINT WORD ON SCREEN
40 GOTO30:REM BEGIN AGAIN
```

Program 18

```
10 REM AVERAGES BY S. COTTON
20 REM THIS PROGRAM WAS LISTED ON THE 15
20 PRINTER/PLOTTER WHICH CANNOT HANDLE
30 REM THE NORMAL CONTROL CHARACTERS.
40 REM INSTEAD IT HAS ITS OWN CHARACTERS
.
50 REM "S" =CLR/HOME AND SHIFT
60 REM "Q" =CURSOR DOWN KEY
70 PRINT"S -----AVERAGES-----"
80 PRINT"QQ HOW MANY NUMBERS DO"
90 PRINT"Q YOU WANT TO ANALYSE."
100 INPUT"QQ ";N
110 PRINT"sQQ PLEASE INPUT THE"
120 PRINT"Q NUMBERS ONE AFTER"
130 PRINT"Q EACH OTHER."
140 FORX=1TO1500:NEXTX
150 FORX=1TON
160 INPUT"sQQQQQQQQQQQQ NUMBER";A
170 T=T+A
180 NEXTX
190 PRINT"sQQQQQQQQQQQQ AVERAGE=";T/N
```

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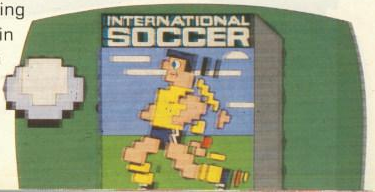

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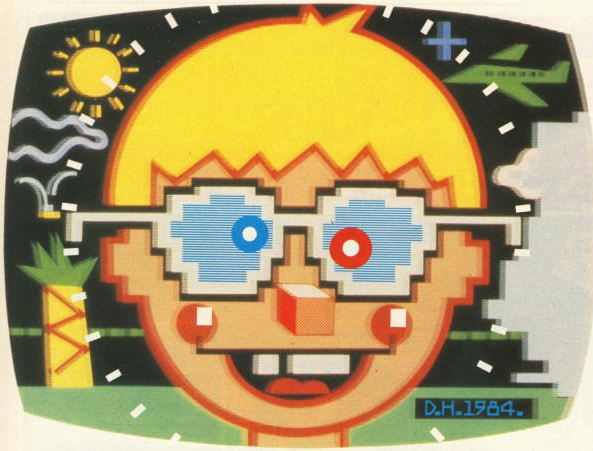

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Graphics in 3D

***Adrian Warman** presents a beginners guide to 3D graphics on the 64 with Simon's Basic*

ONE OF the most popular pastimes for the owner of a home micro is to attempt to produce some really spectacular graphic displays. Unfortunately, it is very rare for even experienced programmers to achieve good results — certainly the sort of pictures produced in many games such as **Beach Head** or **Alice in Videoland** are notable for their rarity just as much as their quality.

All too often, attempts to produce graphics fail through lack of thought or preparation. The aim of this article is to provide a practical demonstration of how a simple 3-D shape can be manipulated, as well as explaining a little of the theory behind the program.

As soon as a programmer has decided to produce a picture of a given object, a whole variety of aspects must be considered. What is the object to be portrayed? What is the object expected to do? Under what conditions will the object perform these actions?

Alice in Videoland

The last of these questions may at first sight appear confusing. It refers to how much of the image will alter as time passes, and with what amount of detail. For example, the famous picture of Alice in the Garden from **Alice in Videoland** is *extremely* detailed, but it is completely static, serving mainly as a background for the game characters and symbols moving across its surface. This means that once drawn, the picture will be unaltered. Conversely, the air battle scene from **Beach Head** is not static at all, and is expected to interact with the user (for example, aircraft fly overhead or the ships move). As a result, to make the picture 'mobile' and also achieve a reasonable response time, the amount of detail is reduced.

What this means in practical terms is that if you want a very fast response time, you cannot have a lot of detail. Conversely, if you want a lot of detail, the response time must become increasingly slower. This generality applies right the way up through to big mainframe computers, and not just for computer graphics. The reason that big computers seem to have the best of both worlds (eg detail and speed, such as shown on commercial flight simulators) is simply that they are very fast with vast memory stores, and often have extra facilities to do selected jobs (the so-called 'dedicated' machines).

The sprites on the Commodore 64 computer do provide an easy way to relocate small quantities of bit-map data at high speed. But, any manipulation of the physical data used in the sprite will either require a lot of time, or a large number of sprite patterns which differ from each other only slightly (and hence better performance requires more speed and/or more memory — preferably the former). The conclusion is not to expect too much from the humble home micro.

But, let us look at what can be achieved. The accompanying program is a very general routine which will move a 3-D wire-frame (ie no hidden lines) representation of a cube through space as it rotates about an axis. An elementary knowledge of geometry is assumed, but so long as you understand the concepts of 'origin' and 'co-ordinates', you should be alright.

The first task is to describe the object to the computer. This is done by listing the co-ordinates in space of each of the eight corners of the cube. For the sake of convenience, the cube is assumed to have the origin in its centre.

However, it is not enough just to tell the computer where the points are, we must also provide information as to how they link up to each other. This is achieved fairly simply by listing the pairs of points which connect to each other.

You should now enter the accompanying program. Once you have got this running (conversion notes for other languages are provided) the theory should be easier to follow.

The program uses very few machine dependant routines, and those which are used are taken from the Simons' BASIC extension cartridge. Only three special commands are used, and they control elementary graphics routines. Referring to the accompanying information should help you to convert to other graphics packages or languages which support graphics — such as Pascal or COMAL. A brief description of the main sections of the program follows:

Lines — **Purpose**

1040 — *The main part of the program starts here. A subroutine call is made to load in the data for the cube, and to set up certain parameters to be used in the drawing routines.*

1050-1090 — *The main loop of the program. The cube will be moved in space on your screen, so for each display the new position for the cube must be calculated, and the cube itself then drawn.*

1060 — *This line HIRES 5,0 switches the Commodore 64 to a high resolution display, with co-ordinates at (0,0) for top left, and (319,199) for bottom right. The numbers represent respectively the information to make foreground points green and the background black.*

1100 — *Exit the program. Some languages will automatically restore the text screen when the program ends, so this method of ending will pause until the user is ready.*

1130 — *The dimension statement sets up arrays to hold the data describing the cube. PTS% holds the co-ordinates of each of the eight corners of the cube. LNK% holds the data for each of the 12 edges of the cube.*

1140-1160 — *Read in the corner co-ordinates.*

1170-1190 — *Read in the edge data.*

1230 — *This function will be used to produce the scaling effect. Its use will be better understood after reading the theory.*

1240 — *As the cube moves, it will be rotated about one of its axes. The angle of rotation is set in this line, and is set here to 0.1 radians (about six degrees).*

1280 — *This is the most important statement in the program. It is responsible for drawing the line (X1, Y1, Z1) – (X2, Y2, Z2). Naturally, a 3-Dimensional line cannot be truly represented on a 2-Dimensional surface (ie the TV screen), and so to 'fake' the effect, more distant objects will appear smaller (in just the same way as on a television programme).*

The Simons' BASIC command LINE X1, Y1, X2, Y2, 1 will draw a line in the current foreground colour from (X1, Y1) to (X2, Y2).

1320-1400 — *This routine will draw the cube. Each edge is drawn one at a time. For each edge, the start (X1, Y1, Z1) position and end (X2, Y2, Z2) position is found, prior to drawing the line.*

1440-1480 — *This routine will rotate the cube around one of its axes. Note that it is the corners that are moved, not the edges. This is because the edges still connect the same corners, but the corners are rotating through space.*

1510-1580 — *The data giving the co-ordinates of each of the corners.*

1600-1710 — *The data describing each edge. Thus, in line 1600, the DATA indicates that corner 1 joins to corner 2.*

1740-end — *The routine to exit the program. Once the drawing has finished, the border will change to dark grey, and the computer will wait for you to press the [RETURN] key.*

1780 — *The command NRM simply restores the text screen.*

3D theory

It is well known that television pictures only appear to be 3-dimensional, an effect achieved by making more distant objects appear smaller. The program performs a methodical operation on a given co-ordinate to scale it up or down in size depending on whether it is close to you or far away. Since we have to decide on an arbitrary zero, we assume that the screen has X values going from −160 to 160 inclusive as you traverse from left to right, and Y values going from −100 to 100 inclusive as you descend from the top to the bottom of the screen.

The Z values are a little more complicated. The program assumes that when Z is −300 units, the object is right on the surface of your eye — this means the ▶

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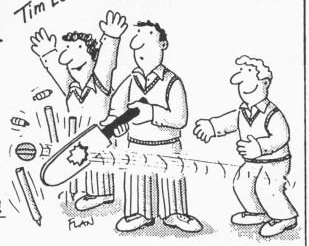

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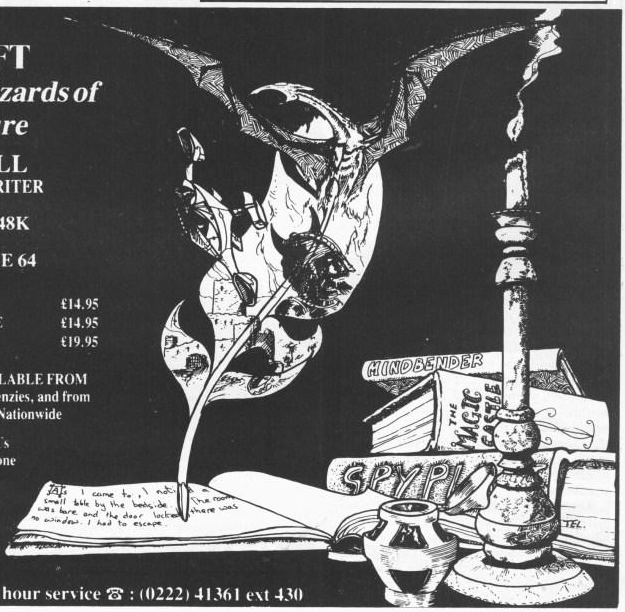

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◀ object appears infinitely large because it is so close. A Z value of zero is taken to mean the surface of the screen itself. Hence if you draw a rectangle with co-ordinates at (−160, −100, 0), (−160, 100, 0), (160, 100, 0) and (160, −100, 0) then it will precisely fill the screen. Lastly, as the positive Z values become larger eg 100, 200, 500, 1000 etc, the object will become smaller as it appears to recede from view. Drawing a cube at a distance of 10000 units will produce no more than a point.

Now, all we need to do is to devise a formula for correcting co-ordinates depending on their distance. It is surprisingly easy to produce an approximate formula with sufficient accuracy for our purposes. Assuming that the size is dependent on the Z value, we find that a co-ordinate with true position (X, Y, Z) has an apparent on-screen position of:

(X (300/(300+Z)) , Y* (300/(300+Z)))*

A close look at this formula shows several points. Firstly, we have converted a 3-dimensional point (X, Y, Z) into a 2-dimensional point (X', Y') for the TV screen. Secondly, the conversion is achieved simply by multiplying by a factor dependant on Z, namely 300/(300+Z). When Z is −299, the expression evaluates as 300/1 which means all points are magnified 300 times, because they are so close. When Z is zero, the expression gives 300/300 = 1, and hence all points appear normal size. Finally, as Z increases to (say) +300, the evaluation gives 300/600 = 0.5, ie all points are half size, and so on.

This simple expression is the one used to scale the co-ordinates in the program and, owing to its frequent use, is defined as a BASIC function in line 1230. The actual statement for drawing a 3-D line using 2-D is listed in line 1280. Note that the addition of +160 or +100 in the values is to centralise the origin (the normal screen is 320 × 200, and so the centre of the screen is at 160,100).

We now have the ability to describe any line in 3-D. By making the two end points of the line to be the same, we can plot a single point. All we need now is something to draw. This is provided by the accompanying program as it draws a cube moving through space.

Two forms of motion are incorporated. The first is that the clube is moving away from you. This movement is controlled by line 1050 (which sets up the value LOC which ranges from −50 to 200, and is the Z value of the centre of the cube) and lines 1350 and 1380. As LOC increases, the cube is supposed to move away. This is done in the latter two lines by adding LOC to the normal value of the Z value of each corner.

The second form of motion is that the cube is rotating around one of its axes. Strictly, the corners of the cube are rotated around the axis. The program as listed will make the cube appear to rotate in a clockwise direction, with the actual change in angle given by line 1240. If you make ANG in this line negative, the cube will rotate in the opposite direction. Similarly, if ANG is set to zero, the cube will not rotate at all. You may like to observe how the cube appears if it rotates around other axes. Try replacing lines 1450-1470 inclusive with either of the following alternatives:

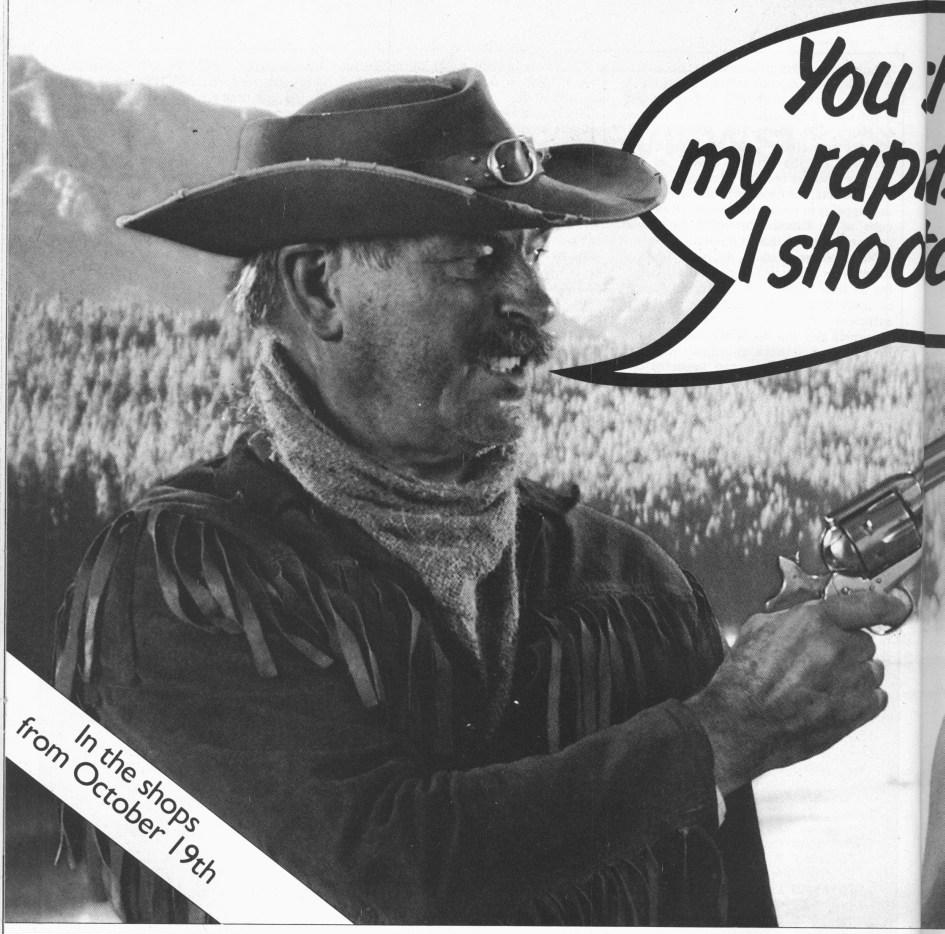
```
1450 Y=PTS%(X,2)
1460 PTS%(X,2)=INT(PTS%(X,2)*COS
     (ANG) − PTS%(X,3)*SIN(ANG) + 0.5)
1470 PTS%(X,3)=INT(Y*SIN(ANG) +
     PTS%(X,3)*COS(ANG) + 0.5)
```

```
1450 Y=PTS%(X,1)
1460 PTS%(X,1)=INT(PTS%(X,1)*COS
     (ANG) + PTS%(X,3)*SIN(ANG) + 0.5)
1470 PTS%(X,3)=INT(− Y*SIN(ANG) +
     PTS%(X,3)*COS(ANG) + 0.5)
```

Each of these alternatives will produce a different type of rotation. For extra effect, try combining two rotations! (Hint: perform one rotation, then perform the next, and so on . . .).

Hopefully, you should now have enough material to try a few experiments for yourself. Even if you do not understand all of the theory, you can see that 3-D effects can be achieved fairly quickly. If you try altering small sections of the program — concentrating on the lines mentioned in the text — you will see what effect they have on the display as it progresses. ■

```
1000 REM 3-D GRAPHICS ROUTINES.
1010 :
1020 REM BY A.WARMAN
1030 :
1040 GOSUB 1130
1050 FOR LOC=-50 TO 200 STEP 25
1060 HIRES 5,0
1070 GOSUB 1320
1080 GOSUB 1440
1090 NEXT LOC
1100 GOTO 1740
1110 :
1120 REM INITIALISE
1130 DIM PTS%(8,3),LNK%(12,2)
1140 FOR X=1 TO 8
1150 READ PTS%(X,1),PTS%(X,2),PTS%(X,3)
1160 NEXT X
1170 FOR X=1 TO 12
1180 READ LNK%(X,1),LNK%(X,2)
1190 NEXT X
1200 POKE 53280,0
1210 POKE 53281,0
1220 PRINT CHR$(30)
1230 DEF FNS(X)=300/(300+X)
1240 ANG=0.1
1250 RETURN
1260 :
1270 REM LINE3D
1280 LINE X1*FNS(Z1)+160,Y1*FNS(Z1)+100,
     X2*FNS(Z2)+160,Y2*FNS(Z2)+100,1
1290 RETURN
1300 :
1310 REM DRAW
1320 FOR X=1 TO 12
1330 X1=PTS%(LNK%(X,1),1)
1340 Y1=PTS%(LNK%(X,1),2)
1350 Z1=PTS%(LNK%(X,1),3)+LOC
1360 X2=PTS%(LNK%(X,2),1)
1370 Y2=PTS%(LNK%(X,2),2)
1380 Z2=PTS%(LNK%(X,2),3)+LOC
1390 GOSUB 1280
1400 NEXT X
1410 RETURN
1420 :
1430 REM ROTATE
1440 FOR X=1 TO 8
1450 Y=PTS%(X,1)
1460 PTS%(X,1)=INT(PTS%(X,1)*COS(ANG)-PTS%
     (X,2)*SIN(ANG)+0.5)
1470 PTS%(X,2)=INT(Y*SIN(ANG)+PTS%(X,2)
     *COS(ANG)+0.5)
1480 NEXT X
1490 RETURN
1500 :
1510 DATA -50,-50,-50
1520 DATA  50,-50,-50
1530 DATA  50, 50,-50
1540 DATA -50, 50,-50
1550 DATA -50,-50, 50
1560 DATA  50,-50, 50
1570 DATA  50, 50, 50
1580 DATA -50, 50, 50
1590 :
1600 DATA 1,2
1610 DATA 2,3
1620 DATA 3,4
1630 DATA 4,1
1640 DATA 1,5
1650 DATA 2,6
1660 DATA 3,7
1670 DATA 4,8
1680 DATA 5,6
1690 DATA 6,7
1700 DATA 7,8
1710 DATA 8,5
1720 :
1730 REM END
1740 POKE 53280,11
1750 GET X$
1760 IF X$<>CHR$(13) THEN GOTO 1750
1770 POKE 53280,0
1780 NRM
1790 END
READY.
```



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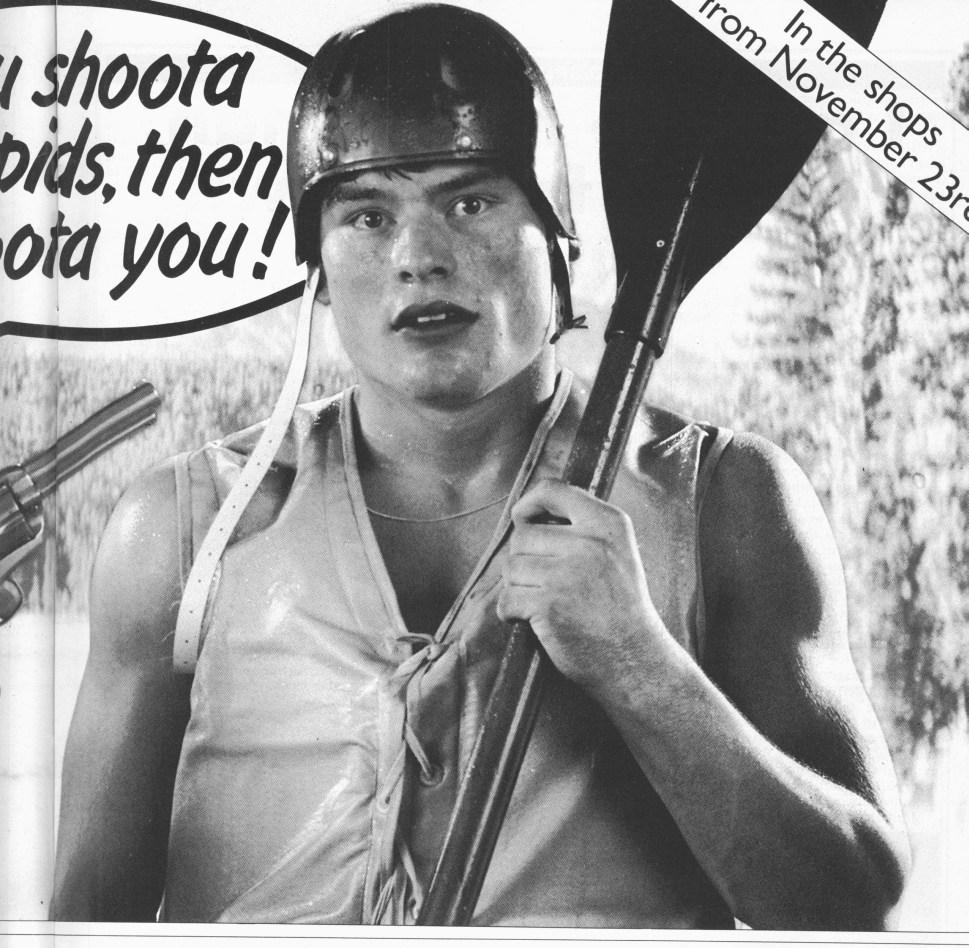

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AUTHOR – PAUL BUNN

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I am the music man, I come from down your way

***David Fox** takes a trip down melody lane with a review of MusiCalc*

HAVING mentioned **MusiCalc** in previous articles on Commodore 64 music, it seems appropriate to take a closer look now, since UK distribution seems well established and additions to the original range are on the way.

The 64's powerful SID (Sound Interface Device) chip gives it the capability of making noises comparable to many dedicated music synthesisers, and since there are three sound channels you can also play chords. The 64's large memory also means that it has the capability to store huge amounts of note information as DATA statements.

The big problem is in accessing all this power through Basic; since nine separate POKEs are needed to fully set a sound register, it's a formidable task to get even a beep out of the 64. It's much wiser to forget Basic and go for one of the many sound synthesis packages now available, of which the most powerful is MusiCalc.

MusiCalc is disk-based only, and is intended to be an open-ended suite of programs which can be revised, updated and expanded by future packages. Most excitingly, there are also plans to incorporate hardware and interface dedicated musical instruments.

MusiCalc comes from Waveform of California, and so far consists of three main programs plus two "templates", the function of which will become clear.

MusiCalc 1, Synthesiser and Sequencer, costs £45. On loading you are presented with a screen display showing all the available sound parameters. Using a system of bar graphs and keys, all the parameters — waveshape, ADSR, frequency, filtering, and so on — can be individually controlled for the three voices.

Synchronised score

On the right of the display is a colourful grid with moving squares which synchronise with the score currently playing.

On loading there are actually 32 scores present as preset files. These range from rock to classical, Latin American, novelties and so on. Scores are selected from the keyboard, as are the 32 "sound sets" — combinations of different voice settings. In other words there are 1024 combinations of score and sound available on loading, which can be altered as you wish, cut down to basic lines for use as backing music, or erased and replaced entirely.

The template disks mentioned earlier contain more of these demo files, the first selections being Rock and Latin American. Needless to say the American idea of Rock and Latin American is pretty laughable, but at least the demos are a good basis to work on.

MusiCalc 1 has six major abilities, which we'll look at in turn. The first is sound synthesis, which is carried out straightforwardly with keys used as toggle switches or incrementors.

Secondly, composition is carried out on the Score Screen, in which an enlarged version of the multicoloured box on the main screen represents the note positions for each of the three voices throughout the composition. Scores are written using the cursor to place blocks on the grid, specifying octave and pitch for each one and adjusting tempo appropriately.

The third function is playing from the keyboard. It's impossible to overcome the inherent difficulties in playing in this manner, but the addition of a mechanical music keyboard is a future possibility. The MusiCalc 3 package, Keyboard Maker (which can only be used in conjunction with MusiCalc 1) can be used to define any keyboard parameters, and to set unconventional scales — great for Stockhausen fans.

The fourth function of the MusiCalc 1 package is to select demo scores or load templates. There is precious little information in the main manual on how to go about this, and I would hope that this lack would be corrected before MusiCalc hits the shops.

"There are 1024 combinations"

The fifth function is the storage of sound/score sets to a blank disk, which means of course that your symphony can be recalled for performance or modification at any time.

The last function, and possibly the most exciting one, is the ability to call in other programs to work with MusiCalc 1.

Again there is an incredible lack of detail in the manuals with which I was provided.

The MusiCalc 2 package, for instance, has the ability to print out musical scores (given a suitable printer), and allows MusiCalc to be synchronised with drum machines such as the ubiquitous Roland TR-606 Drumatix. But how?! There are also hints that effects units such as digital delays can be tied in. MusiCalc 2 costs £31, as does MusiCalc 3.

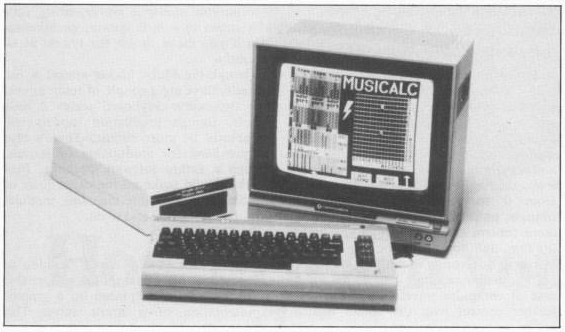
The templates are £15 each, and the next one in the series is The Beat File, a set of drum rhythms ranging from rock to swing.

So MusiCalc is an incredibly powerful system, totally open-ended and capable of allowing composition, music writing and sound synthesis with no necessity for musical training or expensive dedicated equipment.

The main problems at the moment seem to be with the manuals, which are very full and detailed in most places but seem to miss out on some areas altogether. Let's hope the situation is rectified.

Limitless future

The future of MusiCalc is virtually limitless. Although the two American keyboards on show at the Fifth International Commodore Show in June are unlikely to be imported due to prohibitive shipping costs, MusiCalc UK hopes to produce a keyboard for around £80. There's no indication yet whether this will be a full mechanical type or a touch-type.



Other projects include a cartridge version of MusiCalc 1, more templates, and, most importantly, a MIDI interface.

As explained in previous articles, MIDI is a standard which has been adopted by all the major synthesiser manufacturers, allowing synths, drum machines and sequencers to exchange music and patch information. There are already interfaces and software available from SIEL, Sequential Circuits and Rosetti, allowing the 64 to control MIDI-fitted equipment, and the prospects for a MIDI version of MusiCalc are very exciting. Plans are also afoot to allow two 64's to be connected together, presumably controlled by a mechanical keyboard or MIDI synth, allowing six-note computer polyphony.

At the moment MusiCalc is available mail order from MusiCalc UK, The Paradox Group, The Metropolitan, Enfield Road, London N1, 01-241 2448. Retail outlets are being developed, although MusiCalc UK feels that a shop environment is perhaps not the best place to get the feel of the system's possibilities. Admittedly the MusiCalc suite is so powerful that it would take hours to get a full demo — but even the briefest listen will I think win you over. Electronic Soundmaker & Computer Music, a monthly magazine available from all good newsagents, will be carrying an audio tape including a MusiCalc demo in a forthcoming issue. Watch out for it — MusiCalc is well worth hearing. ■

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*ADSR's filters, waveforms and resonance — **David Fox** discovers how easy it is to bash out a tune with Commodore's budget performance package, the remarkable Music Maker*

RECOGNISING AT a remarkably late date that many 64 users want to do more with their machines than squash aliens, Commodore has, in conjunction with the UK's biggest music publishers, Music Sales, come up with the **Music Maker** system.

It allows you to use your micro as a musical instrument, without the disadvantages of keying in note information through the QWERTY keyboard, as you must with most of the available music composition software packages (see *Commodore Horizons* May issue). At the same time you don't have to spend money on a full-size mechanical music keyboard, such as the £99 **Echo 1** or the £129 **Autographics Microsound 64.**

The Music Maker is cheap, easy to use and fun, and should sell in its thousands, especially if it gets into the shops in large quantities in time for Christmas. Basically, it uses the facilities of the 64's Sound Interface Device — the SID chip — to turn the micro into a musical instrument, comparable to one of the cheaper **Casio** home keyboards.

Keyboard

The main feature of the **Music Maker** system is the clip-on mechanical keyboard, which sits over the top rows of the 64 and mechanically depresses the QWERTY keys when pressed. Also included in the package is a set of stickers, which inexperienced musicians can use to aid key identification, a music book, one of the SFX series from Music Sales, and software on disk or tape.

The software, developed by Richard Watts of Milton Keynes Music, gives the 64 many of the capabilities of the immensely popular **Casio VL-Tone.** In the main menu, the function keys can be used to control rhythm select, which gives a choice of four backing rhythm combinations; tempo; bass line; poly play, which gives three-note chords; and voice modify, which allows most of the facilities of the SID chip to be used to define new sounds.

There is a useful performance feature, common on real synthesizers, by which the pitch of the note played can be bent by pressing on the spacebar. Unfortunately it doesn't seem to work in poly mode, or allow downwards pitchbend.

In Voice Modify mode, the four envelope parameters can be changed with simple use of the function keys. Attack, Decay, Sustain and Release — the magic mantra describing the "sound shape" of a voice, the way it fades in, holds at a certain level, then fades out again — can be set from 0 to 15. Waveform sawtooth, triangle, pulse or noises can then be set — these control the sound quality, whether it's thin, dull, low, or in the case of noise, merely a wide hissing sound.

Pulse width can then be selected in the case of the pulse waveform, which gives further control over the sound quality. Filtering — the selection of low or high frequencies to be stressed or removed from the sound — is then selected, as is resonance, the "feedback" or power of the filter.

Popular

Having set your desired sound you can enter a tune with one finger, paying no attention to the timing of the notes. The SFX music books give many examples of popular tunes, but definitions of "popular" are subjective. Elvis Presley's **Wooden Heart** may be some people's idea of music, but give me Klaus Schulze's **Beyreuth Return** any time.

Having entered the notes you can enter the timing by tapping any key in the correct rhythm. The complete tune can then be played back in perfect timing.

Voices or tunes can be saved to tape or disk and reloaded at any time, and there are three demonstration tunes included in the software; **Georgia, Snow Waltz,** and, predictably, **When I'm 64.**

It's very nice to see that there's a tuning facility included in the software; you can tune the 64 to a piano, guitar or any synthesizer. The system could then be used as a primitive sequencer or drum machine, or as a lead or polysynth at a pitch.

The handbook gives some useful suggestions for sound settings, and incorporates guidance on inputting your 64's sound to a hi-fi system, an excellent idea if you mean to use the system at all seriously.

Though the Music Maker system is fun in itself, there are a couple of reservations. The two-octave keyboard seems a little fragile, though production models will apparently be more robust. There's also no provision for modulation of sounds, though a future software package, Pro-Synth, should make all the capabilities of the SID chip available including modulation, sync, ringmod and so on.

Hardware

Other packages planned include a composition program which will enable musical notes to be placed on a graphic representation of a music stave. This package should also allow compositions to be printed out, in the same way that Waveform's **MusiCalc 2** package does.

In fact the Music Maker system should eventually resemble Waveform's more expensive MusiCalc suite of programs. With the initial Music Maker package costing only £29.95, it seems certain that many budding computer musicians will find this the ideal introduction to the subject — and with tantalising hints of further Commodore music hardware, perhaps even a MIDI interface which will allow professional-standard synthesizers to be connected to the 64, Commodore holds out the promise of a happy future for musical 64 owners. ■

Music Maker — good fun, and more to come

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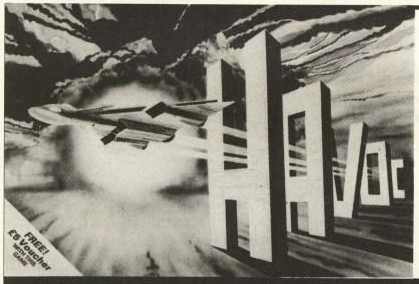

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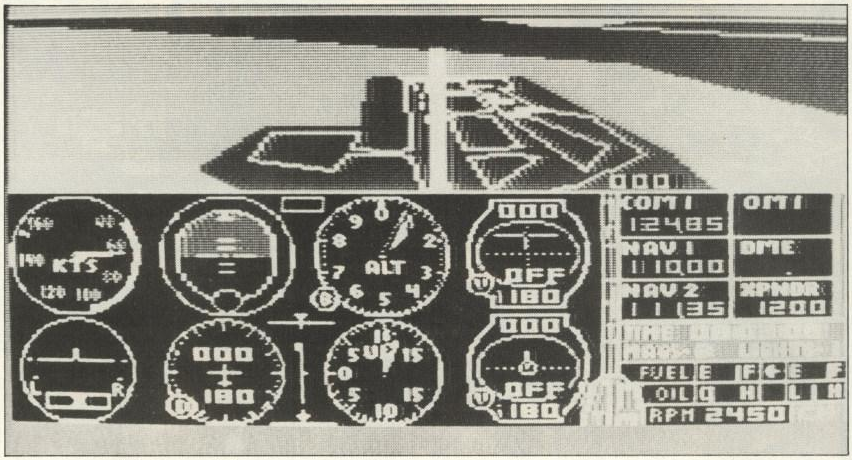

Flight Simulator II takes to the air

That daring young man in his flying machine ***Pete Gerrard*** *finds that taking off is a great deal easier than landing*

THERE ARE flight simulators, and there are flight simulators, and so far most of the material that has been produced has involved little more than pressing a few buttons, hearing a few engine noises and seeing a couple of dials alter on the screen. A real pilot would be very dismayed by the quality of most flight simulator software currently available.

Apart, that is, from this one. **Flight Simulator II** is a programming tour de force, and everything about the package smacks of a loving care and attention to detail. Included in the package is one diskette, one program manual, and one further manual concerning itself with flight physics and aircraft control as it applies both to this program and to flying generally. It is only available on disk, due to the complexity of the suite of programs on it (other programs and on-screen displays are continually called up from disk, and the random access that this provides couldn't hope to be achieved using tape). You can play, if that's the right word for a program of this standard, using a combination of keyboard and one or two joysticks, although you can get by using the keyboard alone if you wish.

Further documentation supplied is impressive. There is a flight reference card, telling you what all the main controls do, along with four maps of various airport areas. These cover the Chicago, Seattle, Los Angeles, and New York and Boston areas, listing all the major airports in the vicinity. Really, the amount of detail that has gone into putting this whole package together is highly commendable.

The only thing that was found to be at fault in a first encounter was an accompanying note, detailing some of the features mentioned in the comprehensive manual that do not, in fact, exist. Since everything else is covered down to the last detail, it seems a shame that such a factor as the effect of wind turbulence has been omitted. However, this is but a minor criticism.

Off the ground

To get off the ground and get the program running requires a good few minutes, during which time you see some mighty strange displays on screen as various high resolution displays are called up and discarded in favour of others. Throughout the game, the border continually changes colour whenever any new files are called up: a nice touch, to let you know that the computer's still doing something.

The plane that you are about to pilot is a Piper PA-28-181 Archer II, which is a single engine plane, top speed of around 150 miles per hour, with non-retractable gears and equipped with a good set of controls. Apparently, this particular plane was chosen because it has a good performance, but is relatively easy to fly.

Once the initial few files have loaded, you are asked whether you are using a colour or black and white monitor (screen displays are tempered according to which is in operation), and then whether you wish to go into demo flight mode or test flight. Either way you are into the program proper, and can start to actually do a few things with the plane.

You start off at Meigs field airport in Chicago, a small airport surrounded by Lake Michigan. The on-screen display is basically split up into two sections, the bottom half displaying the control panel, while the top half is reserved for a solid, colour (if the appropriate option is chosen) three dimensional display of what you're

seeing out of the front of the craft. This display can be altered to give you a view 90 degrees to the left or right, and also a view of what's going on behind you.

Also, at this point in the game before we actually get off the ground, many other parameters and options can be chosen and selected, by entering what is referred to as the editor. Here, such factors as environment, wind speed, slewing system, difficulty of flight (whether you have a tolerant plane, or a more realistic one), season, and so on, can all be readily altered.

There is a further (very large) subprogram within the main set, which turns the program from being a flight simulator into a World War I fighting game, but more of that later. For now, let's get off the ground.

For once, you really do get the feeling that you are actually sitting in a plane on a runway, taxi-ing towards takeoff. As the throttle is opened up and you raise the elevator a little, the sound that you hear changes accordingly, the view from the front of the aircraft gradually changes also, and the control panel in front of you flickers into life.

After a few seconds, that magical moment arrives when you become airborne, and you rapidly realise that you haven't read the manual properly and don't know what on earth (or rather, off it) you're doing. This is quite an alarming feeling, because this package is so realistic. Once in the air, the control panel shows airspeed, altitude, artificial horizon, slip indicator and turn co-ordinator.

Altering the rudder, ailerons, elevators and flaps soon produces a calamity, and with a self-satisfied smirk the machine prints up the simple word "crash!" to indicate that you've had it. No problems here, unlike real life, as you simply start off again.

After a few more experiments which usually result in similar disasters, you slowly begin to get the hang of the thing, and attempt something a bit more serious: a flight to another airport. Not being too adventurous at first, I selected nearby Vermillion County, which seemed like a fairly straightforward flight. Before take-off, you are well advised to consult the map for information on the place you're going to try and get to, since this gives you a wealth of useful information about it, including (of course) where it is in relation to you, in terms of co-ordinates and altitude.

Unsuccessful flights

After a few unsuccessful flights like this, as landing is about the most difficult part of flying (well, landing successfully is) either in real life or using such a realistic simulator as this, you can get more daring and attempt longer flights. The program, after all, is equipped to cope with the whole world, and although you've only got two fuel tanks on board you can obviously land and re-fuel en route to your destination. Landing at some of the more famous airports produces some startling three dimensional displays (the Statue of Liberty!), and throughout I was just so impressed, and so convinced, about the whole thing.

The World War I fighting section mentioned earlier is probably best attempted after a good few hours flying, because a novice at the controls is not going to stand much chance in open warfare. Here we have the familiar three dimensional view out of the front window, but one or two things have changed. Your radar will now show enemy planes approaching, and gives some indication of their relative position and altitude. The plane is now equipped with machine guns, and the sights in the centre of the visual display record what you're aiming at at the time. In my case, usually a mountain or two, but I did manage one or two enemy.

Your mission here is to destroy the enemy, and ransack their bases. On one side of a river live the enemy, on the other side you have your own bases, and it's a good idea to have a recce before declaring open warfare, as this gives you the chance of finding out where everything is.

There is so much that one could say about a set of programs as good as this, that it would take an entire magazine to do justice to it. Professional pilots have said that they reckon it to be about the best simulator they've ever seen, and although I've never flown a plane in my life (and never will after the disasters encountered while trying to get the hang of this), I would have to agree. The review copy was supplied by the 64 Supplies Company of PO Box 19, Whitstable, Kent, which markets Flight Simulator II at £35.

Everything that a pilot would expect to find is in here somewhere, and anybody who has been disillusioned about flight simulators in the past should buy this. If you want something different, and don't mind spending a two week holiday flying planes in the luxury of your front room, then buy it. It's brilliant. ■

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Hideous Bill is back — in Steve Lee's RATWHACK

VIRGIN GAMES has been around for more than a year now, and has matured from a brash, hit-and-miss sort of an affair into a company with a big reputation and a great line-up of games.

Virgin's star programmer Steve Lee has written **Hideous Bill in Rat Whack** specially for Commodore Horizons. Though it's ages since he's written in Basic, he bashed this one out in a few hours — "You could enhance it by adding more sprites to animate Hideous Bill and the rats. Apart from that the game has most of the elements of a commercial game; sound effects, skill levels and progressively more difficult stages."

You must guide Hideous Bill through the maze of deadly oscillating rat whoopsies, to stamp on the rats which scuttle from one dustbin to another. The game requires a joystick in port one, but the Move Man routine at 4800-4899 could be changed to read the keyboard.

Variables include RD, rat directions; T, test for dead rat; CM, pixel counter; DN, direction of pixel movement; SC, score; and LV, lives.

Read this issue's profile of Steve for some background on Hideous Bill and Steve's other programs for Virgin. ■

```
5 PRINT"♣■■■■        RAT WHACK (C) STEVE LEE 1984"
100 GOSUB4900:GOSUB4100
110 GOSUB4800
120 GOSUB4600
130 GOSUB4500
140 GOSUB4400
150 GOSUB4200
200 GOTO110
4000 REM PROGRESSION
4010 X=INT(5*RND(0))
4015 IFX=0THENY=1231:GOTO4040
4020 IFX=1THENY=1391:GOTO4040
4025 IFX=2THENY=1511:GOTO4040
4030 IFX=3THENY=1631:GOTO4040
4035 IFX=4THENY=1791
4040 X=INT(24*RND(0))
4045 Z=INT(3*RND(0))+73
4050 POKEX+Y,Z
4099 RETURN
4100 REM RESET GAME
4110 PRINT"| ▼▼▼▼          PRESS FIRE TO PLAY "
4120 X=PEEK(56321):IF(XAND16)THEN4120
4125 SC=0:LV=5
4130 GOSUB4300:GOSUB4700:GOSUB4560:GOSUB4270
4199 RETURN
4200 REM CHECK FOR MAN/BKG COLL'N
4210 X=PEEK(53279)
4220 IF(XAND16)=0THEN4299
```

Continued on page 54

```
4222 POKE5429Ø,32:POKE5429Ø,33
4223 FORX=1TO3Ø
4224 POKE54287,X:NEXT:POKE54287,Ø
4230 IFPEEK(53259)<8ØTHEN4250
4240 POKE53257,6Ø:GOTO4260
4250 POKE53257,22Ø
4260 LV=LV-1:IFLV<ØTHENGOTO41ØØ
4270 PRINT"| ■■■
```

```
4699 RETURN
4700 REM START NEW RAT
4710 IFPEEK(53257)<140THENPOKE53259,228:GOTO4730
4720 POKE53259,50
4730 IF(RND(0))>.5THENRD=0:POKE53258,30:POKE53264,12:POKE2045,252:GOTO4799
4740 RD=1:POKE53258,50:POKE53264,44:POKE2045,253
4799 RETURN
4800 REM MOVE MAN FROM J/S PORT 1
4801 FORY=0TO1
4802 X=PEEK(56321)
4803 IFPEEK(53256)>251THENX=XOR8
4804 IFPEEK(53256)<90THENX=XOR4
4805 IFPEEK(53257)<56THENX=XOR1
4806 IFPEEK(53257)>216THENX=XOR2
4815 IF(XAND8)THEN4825
4820 POKE53256,PEEK(53256)+4
4825 IF(XAND4)THEN4835
4830 POKE53256,PEEK(53256)-4
4835 IF(XAND2)THEN4845
4840 POKE53257,PEEK(53257)+4
4845 IF(XAND1)THEN4860
4850 POKE53257,PEEK(53257)-4
4860 NEXTY
4870 IF(XAND15)=15THEN4899
4880 POKE54283,32:POKE54283,33
4899 RETURN
4900 REM GET SPRITE DATA
4910 FORX=0TO255
4920 READA:POKE16128+X,A:NEXTX
4930 REM SET UP VIDEO CHIP
4940 FORX=0TO47
4950 READA:IFA=255THEN4960
4953 POKE53248+X,A
4955 POKE53248+X,A
4960 NEXTX
4965 REM SPRITE POINTERS
4970 POKE2040,254:POKE2041,254:POKE2042,254:POKE2043,254
4980 POKE2044,255:POKE2045,252
4985 REM SOUND DATA
4990 FORX=0TO24:READA:POKE54272+X,A:NEXT
4995 RETURN
4999 REM RAT RIGHT DATA
5000 DATA 0,0,0,0,0,0,0,0,0
5010 DATA 0,0,0,0,0,0,0,0,0
5020 DATA 0,0,0,0,0,0,64,0,0
5030 DATA 128,0,128,128,121,128,96,253
5040 DATA 224,17,255,176,19,255,248,13
5050 DATA 190,252,6,198,24,0,99,0
5060 DATA0,0,0,0,0,0,0,0
5070 DATA0,0,0,0,0,0,0,0
5099 REM RAT LEFT DATA
5100 DATA0,0,0,0,0,0,0,0
5110 DATA0,0,0,0,0,0,0,0
5120 DATA0,0,0,0,0,0,0,2
5130 DATA1,0,1,1,158,1,7,191
5140 DATA6,13,255,200,31,255,232,63
5150 DATA125,176,24,99,96,0,198,0
5160 DATA0,0,0,0,0,0,0,0
5170 DATA0,0,0,0,0,0,0,0
5199 REM BIN DATA
5200 DATA0,0,0,0,0,0,0,0
5210 DATA0,0,0,0,31,240,0,99
```

Continued on page 56

```
5220 DATA140,0,196,70,0,204,102,0
5230 DATA224,14,0,191,252,0,222,122
5240 DATA0,221,186,0,219,218,0,219
5250 DATA218,0,219,218,0,219,218,0
5260 DATA219,218,0,219,218,0,219,218
5270 DATA0,123,220,0,31,240,0,0
5299 REM MAN DATA
5300 DATA0,84,0,0,84,0,1,84
5310 DATA0,0,184,0,3,248,0,0
5320 DATA252,0,12,20,0,4,85,0
5330 DATA5,85,0,1,85,64,0,20
5340 DATA64,0,20,192,0,60,0,0
5350 DATA40,0,2,168,0,2,168,0
5360 DATA2,8,0,3,8,0,5,8
5370 DATA0,0,12,0,0,20,0,0
5400 REM VIDEO CHIP DATA
5410 DATA28,49,28,227,65,45,69,227
5420 DATA150,220,24,50,0,0,0,0
5430 DATA12,255,255,255,255,63,255,255
5440 DATA 255,255,255,0,16,255,0,0
5450 DATA 0,11,0,0,0,14,7,15
5460 DATA 15,15,15,4,10,0,0,12
5500 REM SOUND CHIP DATA
5510 DATA0,72,0,8,0,33,0
5520 DATA0,8,0,0,32,35,0
5530 DATA0,1,0,0,32,112,240
5540 DATA0,0,0,15
```

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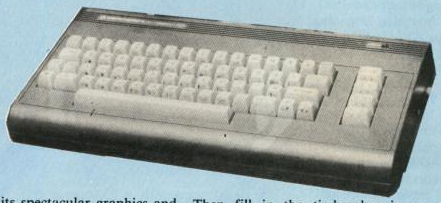

AS A Christmas bonus, Commodore UK is offering a **Plus/4** and a **C16** as prizes in this special competition.

You'll all have read the reviews of Commodore's two fabulous new home computers. The Plus/4, with its built-in software and compatibility with a wide range of Commodore peripherals, is the ideal home applications machine — and the C16, with its spectacular graphics and easy programming language, is the best introduction to computing, as well as being a powerful games machine.

To win, all you have to do is put in order of merit the various features of the new machines. For instance, if you think the most important features is "Easy programming", then enter C in box One. Then fill in the tie-breaker in an apt, original manner in fifteen words or less, and post your entry to the competition address. If you do not wish to cut your copy of Commodore Horizons, photo-copies or neat plain paper copies will be accepted.

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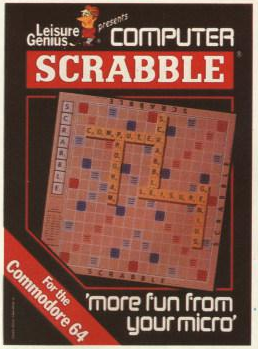

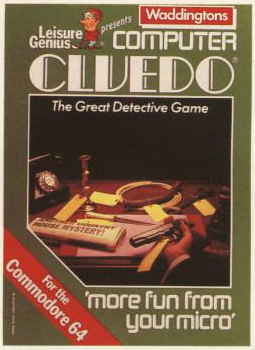

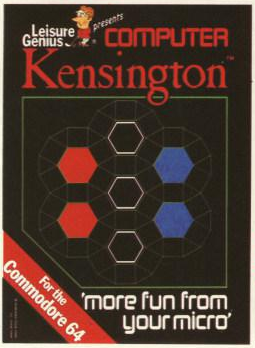

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Charting your progress

In the first of a two-part series, ***David Lawrence*** *shows how to create a variety of charts and graphs*

THE C16 is particularly good at displaying information in ways which are more immediately understandable than lists of facts and figures. This article (together with next month's) consists of three programs which will create graphs of one kind or another, both in low and high resolution.

The programs are: Graph which creates a very effective and powerful line graph in high resolution, Piechart which will take a limited amount of data and display it in the form of a circle split into multi-colour segments and Graph II which allows you to create a stunning 3-D barchart.

One of the problems of working within 16K of memory is that high resolution programs will always eat into what is available, leaving very little scope for the manipulation of data in applications programs. In the first **Graph** program, we examine one way round this limitation by creating a program which does not have to devote memory to placing prompts on the screen, storing data in arrays or placing data for storage on to disk or tape. Techniques introduced during the course of the **Graph** program include the flexible use of DATA statements and the use of logical conditions as variables.

Modules 2.1.1 and 2.1.2 hold the data for the graph. Don't be concerned if at this stage you find it difficult to see the relevance of all the figures. Their use will become plain once you have entered and run the program once or twice, and experimented with making some changes.

Commentary

Lines 3030-3050: These lines contain the name which the user wishes to give the graph as a whole, and the labels to be attached to the vertical and horizontal axes. Note that in each case the phrase before the comma in DATA statement is there solely for the convenience of the user and will be ignored by the program — the comma is essential to separate the first phrase from the important information which follows it.

Lines 3060-3070: The two axes of the graph will be divided up into units for ease of reading. The axes will always be the same length, but the user can specify how many units each will be split up into.

Line 3080: If, for example, the graph was meant to be recording tons of wheat produced by a country over a number of years, the user might wish to make each unit on the vertical axis record a unit of 1,000 tons. Rather than make the user divide up the actual figure into units of 1,000 before entering it, the figure in this line allows the units to be specified so that every figure can be entered in full.

Lines 4030-4040: These lines hold the DATA on which the graph will be based. In this example, these figures will produce a smooth, bell-shaped curve. Note that there is provision for only one figure for each unit on the horizontal axis, starting at position one, though the whole of the horizontal axis does not have to be used. As many DATA items as desired may be included on each separate line, within the limit of two screen lines for a program line.

Lines 4050-4090: These lines allow more data to be entered, though they are not needed in the test graph presented here. You can use as many data statements as memory will allow, but the information must be terminated by a DATA statement containing the word END. This is the signal to the program that it has reached the end of the DATA to be used for the graph — even if more DATA statements follow.

Module 2.1.3 draws the framework onto which the eventual graph will be placed, complete with the units on the axes and the various labels specified.

Commentary

Lines 1050-1070: The two axes are drawn, a line from near the top left hand corner of the screen to near the bottom left hand corner, continuing at a right-angle across the bottom of the screen to near the bottom right-hand corner.

Line 1080: The C16's data pointer is set to point to the first item of DATA following the start of the module at 6000. This RESTORE will prevent an OUT OF DATA error being generated if the program is started with GOTO. Using RUN sets the pointer to the first item of DATA anyway.

Lines 1090-1110: The labels for the graph as a whole, the horizontal axis and the vertical axis are read from the DATA statements and printed on the screen. In the case of the label for the vertical axis, a loop is used to print the label character by character down the left hand side of the screen.

Note that in each case there are two READ instructions. The first one picks up the phrase *before* the comma in the DATA statement. This is then immediately discarded by READing another string into the same variable, T$.

Modules 2.1.1 and 2: Lines 3000–4090

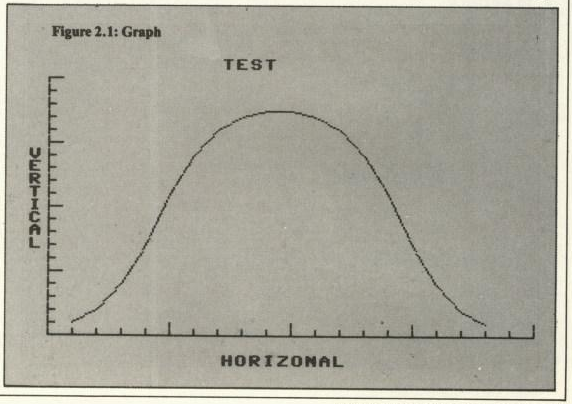
```
3000 REM**********************************
3010 REM DATA 1
3020 REM**********************************
3030 DATA GRAPH TITLE,TEST
3040 DATA H/AXIS NAME,HORIZONAL
3050 DATA V/AXIS NAME,VERTICAL
3060 DATA UNITS ON H/AXIS,20
3070 DATA UNITS ON V/AXIS,20
3080 DATA AMOUNT PER V/UNIT,10

4000 REM**********************************
4010 REM DATA 2
4020 REM**********************************
4030 DATA 10,20,40,70,110,140,160,170,175
4040 DATA 175,170,160,140,110,70,40,20,10
4050 DATA END
4060 DATA
4070 DATA
4080 DATA
4090 DATA
```

Line 1120: The number of divisions to be placed on the vertical axis (NV) is read from the next DATA statement. The length of the vertical axis (160 pixels) is then divided by this number to arrive at the length of each division in pixels (LV).

Lines 1130-1150: This loop draws small marks on the vertical axis to record the divisions specified by the user. One thing ▶

Figure 2.1: Graph



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◀ to make note of here is the expression 4*(I/5 = INT(I/5)), which has the effect of making the mark for each unit bigger than the rest. To understand the expression, you need to know something about the way in which logical conditions are created by the C16.

When the C16's BASIC Interpreter, the massive machine code program which runs BASIC for you, comes across a condition following an IF, something like A>B, A=B or A<=B it needs to determine whether that condition is true or false before deciding whether to carry out the action specified by the IF statement. Thus:

IF A>B THEN GOSUB 1000

will be acted upon if A>B is *true* (eg A = 10 and B = 9) and ignored if it is false (eg A = 9 and B = 10). In order to make its decision, the condition is evaluated according to the current values of A and B (or whatever variables have been specified) and the condition is given a *value* which is minus one if the condition is true and zero if the condition is false. It is the *value* rather than the condition itself that matters, a fact which you can demonstrate for yourself by conducting the following small test. Enter, in direct mode:

A=5[RETURN]
IF A THEN PRINT "TRUE" *[RETURN]*

The result will be that TRUE is printed on the screen since the value following the IF statement is not zero (any non-zero value, positive or negative, will produce the same effect). Now try:

A=0[RETURN]
IF A THEN PRINT "TRUE" [RETURN]

Module 2.1.4: Lines 2000–2200

```
2000 REM**********************************
2010 REM DRAW GRAPH
2020 REM**********************************
2030 TRAP 2180
2040 RESTORE 4000
2050 COLUMN=1
2060 READ T1#,T2#
2070 DO UNTIL T2#="END"
2080 READ T3#
2090 X1=20+LH*COLUMN
2100 Y1=180-INT(VAL(T1#)/UNIT*LV)
2110 COLUMN=COLUMN+1
2120 X2=20+LH*COLUMN
2130 Y2=180-INT(VAL(T2#)/UNIT*LV)
2140 DRAW,X1,Y1 TO X2,Y2
2150 T1#=T2# : T2#=T3#
2160 LOOP
2170 GETKEY A#
2180 GRAPHIC 0,1
2190 LIST 3000-
2200 END
```

This time, nothing will be printed on the screen. At the moment, however, we are not so much interested in the way IF works but in the way conditions are evaluated, so try the following:

A = 1[RETURN]
B = 1[RETURN]
PRINT A = B[RETURN]

What you should see is −1, the value of a true condition. Now try:

A = 1[RETURN]
B = 2[RETURN]
PRINT A = B[RETURN]

The result now will be 0, since the condition is not true. At first this may seem interesting but moderately irrelevant. In fact, this ability to extract a value from a logical condition is of great value in programming, as line 1140 illustrates.

What line 1140 does is to draw a series of lines at right angles to the vertical axis to mark the divisions specified by the user. The length of these lines is normally four pixels. However, whenever the value of the loop variable I is exactly divisible by five (ie every fifth mark) the condition (I/5 = INT(I/5)) will be true and will take on the value minus one rather than zero. In other words, including −4*(I/5 = INT(I/5)) in the line which specifies the length of the mark to be DRAWN, allows every fifth mark to be doubled in length without the use of a complex IF. .THEN. .ELSE statement.

Note that to *add* four to the length of the mark, we have to *take away* four times the value of the condition, since its value when true is *minus* one — taking away a minus number is equivalent to adding a positive one.

Lines 1160-1190: Exactly the same process is carried out for the horizontal axis. Note that here, the small marks are drawn upwards from the axis and so move from position 180 to position 176 down the screen. To increase the length of the mark, the 176 has to be reduced to 172, and this is done by *adding* four times the value of the true condition.

Line 1200: The number of units represented by each division on the vertical axis is read from the DATA statement.

Testing

To test this part of the program, all that is necessary is to RUN the program so far. You should see the graph grid drawn on the screen with TEST at the top, VERTICAL down the left-hand side and HORIZONTAL along the bottom. The two axes should be neatly divided up into 20 units each.

Hint: At the end of this test you will be left in high resolution mode. There is no need to use a function key to produce GRAPHIC and add 0 or to try to type in GRAPHIC0 blind to get back to the text screen. Simply press *any letter key* (not a number), followed by RETURN. This will generate a syntax error which automatically returns you to low resolution. This simple technique will save you a great deal of time in the future.

Module 2.1.4 draws the graph itself, using the information specified in the DATA2 module (Module 2.1.2).

Commentary

Lines 2030 and 2170-2190: Pressing STOP at any time during the main drawing sequence, or pressing any key once the graph has been drawn, returns the C16 to low resolution and lists out the data on which the graph is based. This makes examining and changing the graph extremely easy.

Line 2050: COLUMN will be used to record the position of an item of data along the horizontal axis.

Line 2060: Two items of DATA are picked up. The reason that two are READ before the main loop is that the graph can only be begun if there is a place to draw *from* and a place to draw *to*.

Line 2070: On each pass through the loop, a new line will only be drawn if there is a valid co-ordinate for it to be drawn to rather than the END indicator.

Lines 2110-2130: These lines define the two points between which two points on the graph will be drawn. The X, or horizontal, co-ordinates are calculated by multiplying COLUMN (the number of units the graph has progressed along the horizontal axis) by the length in pixels of the horizontal units (LH). The constant 20 is the distance that the start of the horizontal axis is inset from the left of the screen. ▶

Module 2.1.3: Lines 1000–1200

```
1000 REM**********************************
1010 REM DRAW GRID
1020 REM**********************************
1030 COLOR 0,1 : COLOR 1,8,4
1040 GRAPHIC 1,1
1050 LOCATE 20,20
1060 DRAW TO 20,180
1070 DRAW TO 300,180
1080 RESTORE 3000
1090 READ T$,T$ : CHAR,15,1,T$
1100 READ T$,T$ : CHAR,15,24,T$
1110 READ T$,T$ : FOR I=1 TO LEN(T$) : CHAR,0
,7+I,MID$(T$,I,1) : NEXT
1120 READ T$,NV : LV=INT(160/NV)
1130 FOR I=1 TO NV
1140 DRAW,20,180-I*LV TO 24-4*(I/5=INT(I/5)),
180-I*LV
1150 NEXT
1160 READ T$,NH : LH=INT(280/NH)
1170 FOR I=1 TO NH
1180 DRAW,20+I*LH,180 TO 20+I*LH,176+4*(I/5=
INT(I/5))
1190 NEXT
1200 READ T$,UNIT
```

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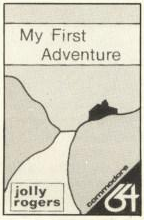

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◀ The Y, or vertical, co-ordinates are slightly more complex. Starting from the basis of the bottom end of the axis, which is 180 pixels down the screen, the value of the DATA item is first divided by UNIT. Thus if the DATA item were 1,000,000 and the user had specified that the vertical axis was to be divided into units of 100,000, (UNIT = 100,000), then the result would be 1,000,000/100,000 or 10 units. Having arrived at the number of units, this is then multiplied by the length in pixels of the vertical units (LV). The figure arrived at is subtracted from 180 since the screen is numbered from zero at the top.

Line 2150: Each time a single line is drawn on the graph, its end point becomes the start point for the next line. If T3$ contains END, however, the following line will terminate the execution of the loop.

Testing

RUN the finished program and you should see a smooth, bell shaped curve drawn. When drawing is finished, press any key and you should see the DATA modules listed onto the screen so that you can alter them at will.

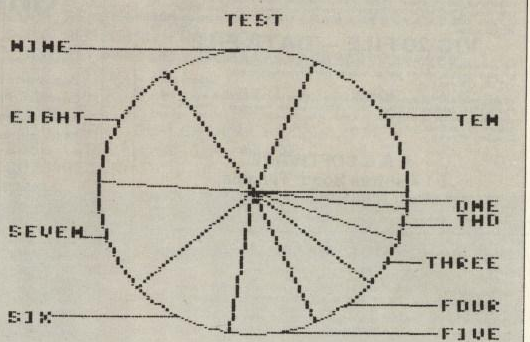
One very useful way of presenting small amounts of data is the pie chart technique, where a circle is broken up into segments representing the proportion of a total handed over to the different parts which make it up. In the program which follows we shall draw on what we have already learned about the mathematics of circles and the flexible use of DATA statements in the last program.

As with the previous high resolution graph, the figures on which the present graph will be based are contained in DATA statements, this time in module 2.2.1. Note, however, that in the program as listed, the two arrays which will be used to hold the name of each item and its value are not dimensioned, so you are limited to 10 items.

Frankly, a pie chart with more than 10 items is of little value, because it becomes too crowded to really take in the information. Even so, you can if you wish include a dimensioning statement at the beginning of the program. If you do include such a statement and increase the number of items, you may find that you have to drop some of the module headings, since the program runs right up against the limits of memory.

Module 2.2.2 processes the data for the chart. The information contained in the DATA module is read into the variables NAME$ and ITEMS, and the arrays NAME$ and A.

Figure 2.2: Pie Chart



(Note the relative crudity of the lettering in graphics mode two)

Module 2.2.1: Lines 4000–4080

```
4000 REM*********************************
4010 REM DATA FOR CHART
4020 REM*********************************
4030 DATA TITLE,TEST
4040 DATA NUMBER OF ITEMS,10
4050 DATA NAMES,ONE,TWO,THREE,FOUR,FIVE,SIX,S
EVEN,EIGHT,NINE,TEN
4060 DATA
4070 DATA QUANTITIES,1,2,3,4,5,6,7,8,9,10
4080 DATA
```

Module 2.2.2: Lines 5000–5110

```
5000 REM*********************************
5010 REM PROCESS DATA
5020 REM*********************************
5030 RESTORE 4000
5040 READ T$,NAME$
5050 READ T$,ITEMS
5060 READ T$ : FOR I=0 TO ITEMS-1 : READ NAME
$(I) : NEXT
5070 RESTORE 4070
5080 SUM=0 : READ T$ : FOR I=0 TO ITEMS-1 :
READ T : SUM=SUM+T : NEXT
5090 RESTORE 4070
5100 READ T$ : FOR I=0 TO ITEMS-2 : READ T :
A(I+1)=(T/SUM)*360+A(I) : NEXT I
5110 RETURN
```

Commentary

Lines 5080-5100: The value of the items to be charted are first added together to discover the total that the circle will represent. The DATA pointer is then RESTOREd to the beginning of the quantity figures and each quantity is translated into a second figure which, when divided into 360, would give the same result as the original quantity divided into the total. For instance, if the total were 100, and the quantity for one item were 25, this would be translated into 90, or 25% of 360. These new figures will later be used to determine how large a chunk of the pie chart will be given to each item.

Testing

Enter the following lines from what will eventually be the control module, and then RUN the program:

```
1040 GOSUB 5000
1110 END
```

If all is well, then nothing should happen visibly — only if there is an error of some kind will you see anything. If you wish, however, you can print out the contents of the variables and arrays named in ▶

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◀ the module just to reassure yourself.

Module 2.2.3 sets up the graphics mode and associated colours, and draws an 80*80 circle in the centre of the screen, together with the name for the chart.

Commentary

Line 2030: The graphic mode we are going to use is multicolour mode, which will allow us to have three different colours (plus the background) on the screen at the same time. The advantage to this is that it makes the chart easier to read. But the more colours it is possible to have on the screen at any one time, the more complicated it is for the C16 to record the colour of each individual pixel, and the more memory is needed.

Since the graphics screen already eats up enough of the memory, when we go into multicolour mode the operating system does a trade-off between colour and detail. Once in mode three the smallest unit we shall be able to actually *do* anything with will be one pixel down by *two* pixels across. The screen, as far as the C16 is concerned, will no longer be 320 pixels across but 160, thus saving memory which can be devoted to remembering the greater range of colours.

From now on, therefore, whenever you look at the X co-ordinate (across the screen) of anything in this program, remember that you need to double it before it is comparable with the same co-ordinates in previous high resolution programs in the book which use normal high resolution.

Line 2040: The little expression in the CHAR statement simply ensures that no matter how long the title given to the chart, it should always look as if it has been printed roughly in the middle of the top line.

Module 2.2.3: Lines 2000–2070

```
2000 REM*********************************
2010 REM DRAW FRAMEWORK
2020 REM*********************************
2030 GRAPHIC 3,1
2040 COLOR 0,1 : COLOR 1,2 : COLOR 2,4,4 :
COLOR 3,6,4
2050 CHAR ,20-LEN(NAME$)/2,0,NAME$
2060 CIRCLE ,80,100,40,80
2070 RETURN
```

Line 2060: An illustration of the point made earlier about dimensions in multicolour mode. To make sense of the position and dimensions of this circle, multiply the first and third parameters by two.

Testing

Add the following lines and then RUN the program:

```
1060 GOSUB 2000
1080 GETKEY A$
1090 GRAPHIC 0
```

The result should be nothing more exciting than the title given to the chart and a white circle. Press any key except RUN/STOP to get back to the normal screen.

Module 2.2.4 draws in the segments into which the chart will be divided, colours them and attaches the labels specified in the DATA module. In order to understand what is going on, you will need to be able to remember the simple mathematics of a circle.

Commentary

Lines 3030-3060: A series of lines are drawn from the centre of the circle to the circumference, dividing the circle up into the segments for the chart. The figures used are those calculated in Module 2.2.2.

Lines 3080-3100: The angles at which the segments start are calculated again, but four degrees are added to each to clear the lines drawn by the previous loop. A position is then calculated on the basis of this angle which is just inside the circumference of the circle. The PAINT command is then used to colour the wedge shaped segment in which the current point falls.

Line 3090 produces a cycle of the three foreground colours specified in Module 2.2.3, except for the last segment, which is left as background colour. This is because it ensures that the final segment cannot be the same colour as the first. Since they are next to each other this would make the chart harder to read.

Lines 3110-3120: These two lines calculate an angle half way between the start and finish point of the current segment. It is possible that in moving from the start point to the finish point we will cross the 360-0 boundary on the circle, producing a nonsense figure — adding 180 rectifies this.

Lines 3130-3150: The figures needed for defining a point in relation to the radius. The reason that the SIN and COS values are stored in the variables TX and TY on this occasion is that they are going to be used more than once in a line and there would not be room to spell them out in full.

Line 3160: You will recognise the use of a logical condition here. Its effect is to make DX either zero or 159 according to whether the point defined by TX and TY is to the left or the right of the centre of the circle.

Lines 3170-3180: A line is drawn from the circumference of the circle to the edge of the screen on the left or the right as defined by DX. At the end of the line, or rather over it, is printed the label for the segment to which the line points. The print position for labels on the right hand side is moved to the left so that they do not run off the end of the screen, again using a logical condition.

Module 2.2.4: Lines 3000–3200

```
3000 REM*********************************
3010 REM INSERT SEGMENTS
3020 REM*********************************
3030 FOR I=0 TO ITEMS-1
3040 R=A(I)/180*π
3050 DRAW ,80,100 TO 80+40*COS(R),100+80*SIN(
R)
3060 NEXT I
3070 FOR I=0 TO ITEMS-1
3080 R=(A(I)+4)/180*π
3090 CC=I-3*INT(I/3)+1  : IF I=ITEMS-1 THEN C
C=0
3100 PAINT CC,80+32*COS(R),100+72*SIN(R),1
3110 TA=(A(I)+A(I+1+ITEMS*(I=ITEMS)))/2
3120 IF A(I+1)<A(I) THEN TA=TA+180
3130 R=TA/180*π
3140 TX=80+40*COS(R)
3150 TY=100+80*SIN(R)
3160 DX=ABS(159*(TX>80))
3170 DRAW ,TX,TY TO DX,TY
3180 CHAR 1,DX/4+(LEN(NA$(I))-1)*(DX=159),TY/
8,NA$(I)
3190 NEXT I
3200 RETURN
```

Line 3160: You will recognise the use of a logical condition here. Its effect is to make DX either zero or 159 according to whether the point defined by TX and TY is to the left or the right of the centre of the circle.

Lines 3170-3180: A line is drawn from the circumference of the circle to the edge of the screen on the left or the right as defined by DX. At the end of the line, or rather over it, is printed the label for the segment to which the line points. The print position for labels on the right hand side is moved to the left so that they do not run off the end of the screen, again using a logical condition.

Testing

Add the following line and RUN the program:

```
1070 GOSUB 3000
```

You should see a display like the one at the beginning of the section for this program, except that it will be in colour rather than plain black and white.

Module 2.2.5 is the control module. ▶

◀ Most of the lines for this have already been entered, but make sure that you have all the lines listed in the module or you will miss one or two refinements.

Commentary

Lines 1030 and **1120-1130:** A brief error message to indicate that there is probably an error in the layout of the DATA module — that is not infallible as a test, since some mistakes will not generate errors detectable by TRAP.

Testing

Change one of the figures under the QUANTITIES heading to a letter, then RUN the program. You should see the program error message and then the DATA module listed out. Correct the deliberate mistake and RUN the program again. This time, pressing RUN/STOP (or any key once the chart is drawn) should list out the DATA module.

Having looked at two different means of presenting data in high resolution mode, it is wise to remind ourselves of the immense flexibility which Commodore's excellent low resolution graphics set provides. Using the low resolution gaphics characters not only provides the user with ready made effects which it would be extremely difficult to provide in high resolution, it allows the full range of colours to be employed and, not least, frees the memory which would otherwise be tied up in the high resolution screen.

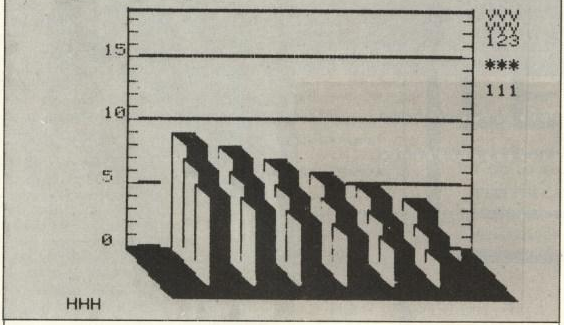
In the final program we shall create a three dimensional bar chart whose display is, I think, one of the best demonstrations of just how impressive the C16's low resolution can be — in fact the kind of display that will have you calling in the family to show them just how clever you really are.

Module 2.3.1 looks after the initialisation. It is a straightforward module to declare a small number of variables and arrays.

Commentary

Line 2050: The array HH will be used to store the data for the graph. Since the figures in the DIM statement must be counted from zero, what is provided here is space for three sets of seven data items.

Figure 2.3: 3D Graph



Module 2.3.1: Lines 2000–2090

```
2000 REM*********************************
2010 REM INITIALISE
2020 REM*********************************
2030 COLOR 0,11 : COLOR 4,10 : SCNCLR
2040 CHAR,16,1,"[RVS ON][RED]GRAPH" : PRINT
2050 DIM HH(2,6)
2060 R$=CHR$(13)
2070 CO$="[YEL][GRN][PUR]"
2080 INPUT "[BLK][CD]LOAD▽FROM▽DISK▽(Y/N):";0
$
2090 RETURN
```

Module 2.2.5: Lines 1000–1130

```
1000 REM*********************************
1010 REM CONTROL
1020 REM*********************************
1030 TRAP 1120
1040 GOSUB 5000
1050 TRAP 1090
1060 GOSUB 2000
1070 GOSUB 3000
1080 GETKEY A$
1090 GRAPHIC 0
1100 SCNCLR : LIST 4000-4999
1110 END
1120 PRINT "PROBABLE▽INVALID▽DATA▽FORMAT"
1130 FOR I=1 TO 3000 : NEXT : RESUME 1100
```

Line 2060: The string R$ will be used in the data file module and explanation can wait until that module.

Line 2070: This string is made up of three colour control codes, ie characters which, if printed, change the print colour. The three colours, in order, represent yellow, green and purple. Later on, the string will be used to provide flexible changes from one colour to another.

Line 2080: This INPUT is designed to allow a later module to call up a set of data for a graph from disk (or tape).

Module 2.3.2 (which will be printed next month) accepts the data. Since we are working in low resolution, there is no need for us to adopt the ruse of using DATA statements to store changing information. Most programs which work on useful information will make provision for the user to input such information while the program is running — such programs are known as interactive. In the case of the present program, all the information can be gathered at one time, so what we see is a module which requests information, uses that information to ask for more and performs checks for mistakes in entry.

Commentary

Lines 3050-3060: As with the line graph program, earlier, each single unit on the vertical axis can represent any value specified by the user. Note that because we are working in low resolution we do not have the same flexibility as the previous program in the size of the vertical units. The only practical size for each unit is one character square's height, and the format of the graph will allow 19 units on the vertical axis.

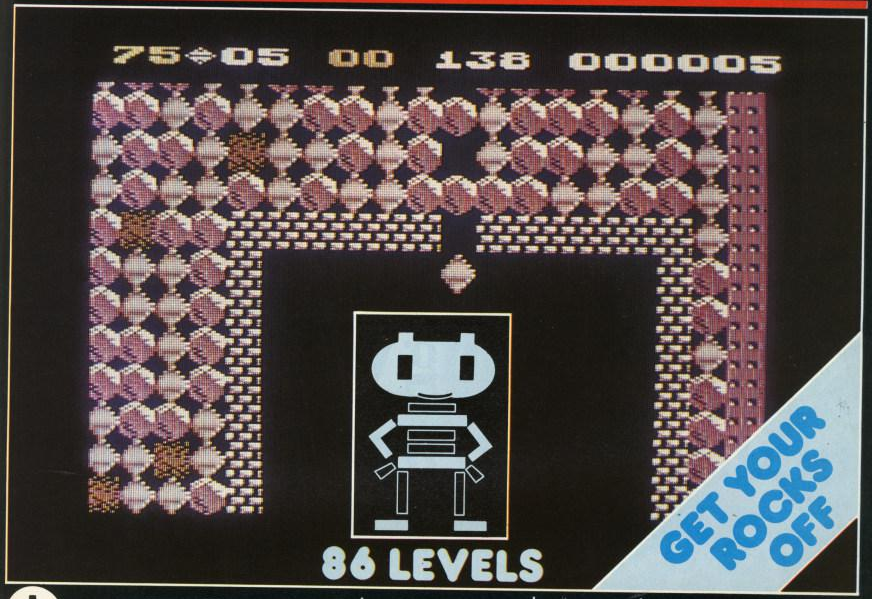
Lines 3070-3080: The graph will allow, as mentioned previously, three sets of six items to be presented. They will be displayed in the form of three lines of up to six solid bars. Each line of bars will be called a bank, and the individual bars will be called columns.■

The final part of this article will be published next month.

This article is based upon an extract from *The Working C16* by David Lawrence. It is published by Sunshine Books and costs £6.95.

BIGGER, BOULDER, More BEAUTIFUL

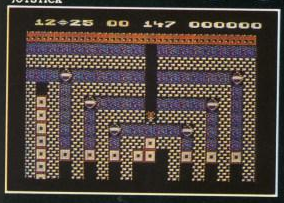
AMERICAN NO 1.



JOYSTICK

BOULDER dash

commodore 64



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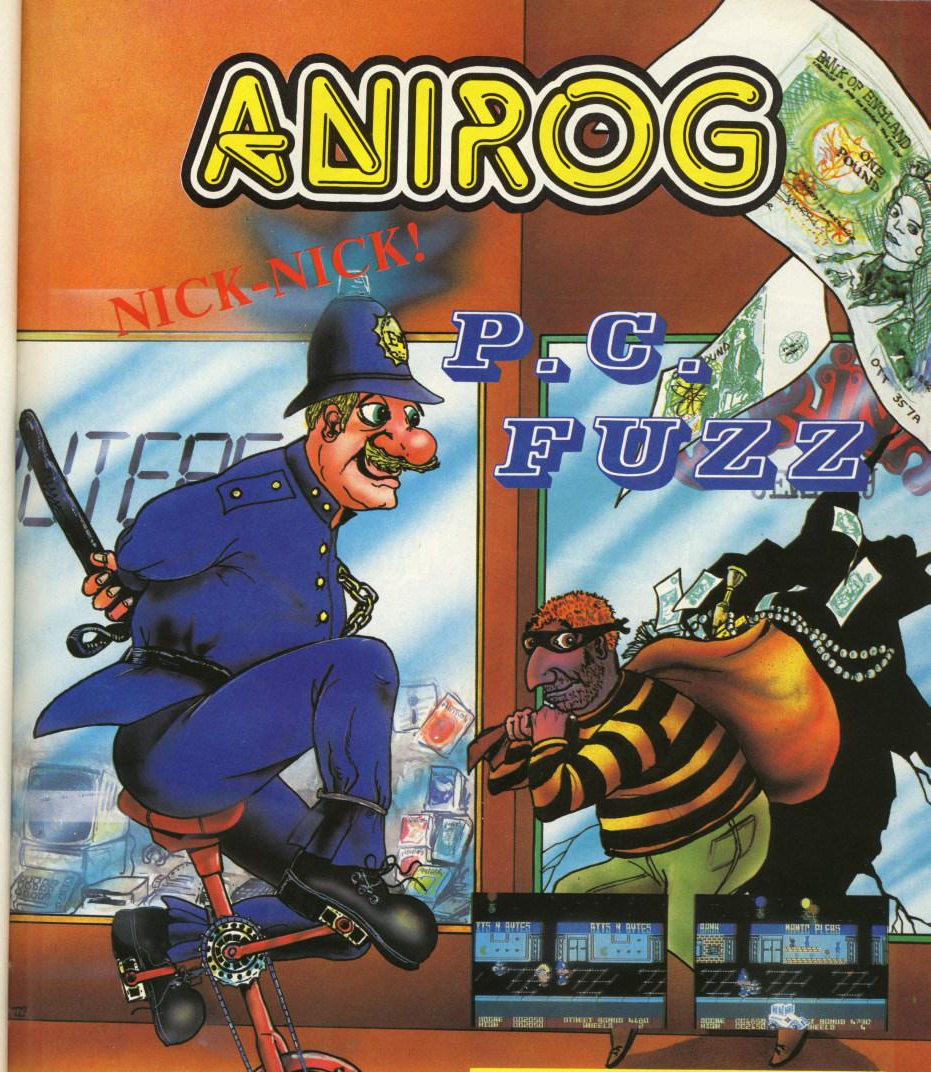
P.C. FUZZ



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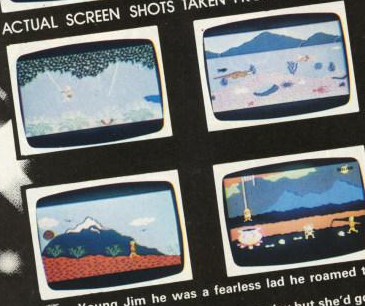

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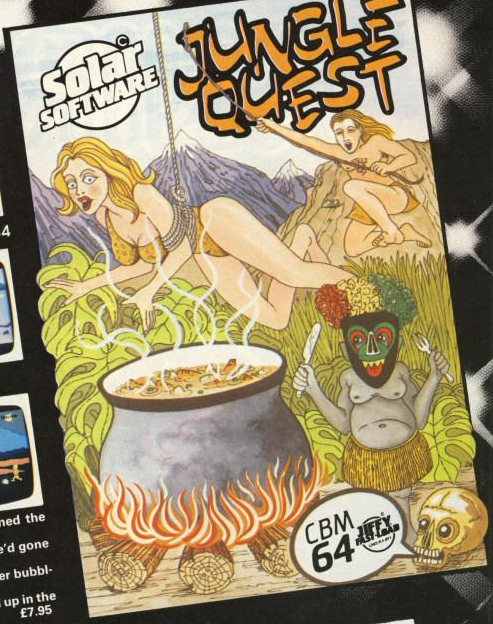

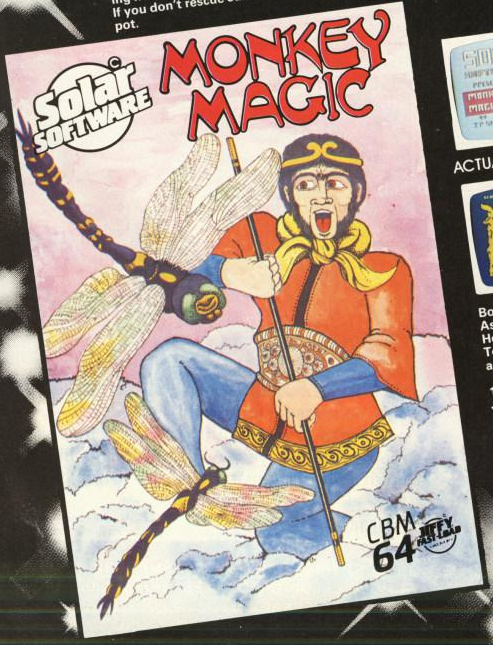

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COMMODORE SOFTWARE FILE

Laser Zap

Samir Devani from Bromley sends this program for the 64

THE AIM of Lazer Zap is to destroy the enemy ships and capture flying letters. Let the letters move into your clutches, and avoid the Zapper, which will shoot your ship if you fall in line with it. Bomb the enemy ship or it will fire homing missiles, and look out for the ships of your comrades plunging from the sky. More instructions are included in the program. Use a joystick in Port One. Collect all the letters and they spell a message, and the game comes to an end.

```
1 REM**************
2 REM* LASER ZAP *
3 REM*BY S.DEVANI*
4 REM*CLUB HOUSE *
5 REM**************
6 REM
7 REM:REDIFINE CHARACTERS
8 GOSUB1305:DIMS(70):POKE650,128
10 PRINTCHR$(142):POKE52,48:POKE56,48:CLR:POKE56334,PEEK(56334)AND254
15 POKE1,PEEK(1)AND251:FORI=0TO511:POKEI+12288,PEEK(I+53248):NEXTI
20 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)OR1:POKE53272,(PEEK(53272)AND240)+12
25 FORA=12288TO12288+7:READAA:POKEA,AA:NEXTA:J=1
30 DATA 255,128,248,252,248,128,255,0
35 FORB=12792TO12792+7:READBB:POKEB,BB:NEXTB
40 DATA 0,0,3,3,255,127,63,31
45 FORC=12552TO12552+7:READCC:POKEC,CC:NEXTC
50 DATA 0,0,192,192,255,254,252,248
51 FORUY=12448+23TO12448+30:READEW:POKEUY,EW:NEXTUY
52 DATA 0,60,60,60,60,24,24,0
55 FORD=12784TO12784+7:READDD:POKED,DD:NEXTD:POKE53281,0
60 DATA 0,0,60,60,60,60,126,255
61 FORI=12448TO12455:READ L:POKEI,L:NEXT
62 DATA 24,24,24,60,60,60,24,0
65 REM:INTIALIZE VARIABLES
70 AB=1424:AC=55696:Z=1984:ZZ=56256:I=1985:II=56257:O=1942:OO=56214:PRINT"□"
71 OP=1423:PO=55695:EW=1024:TY=55296
72 FOROQ=1TO40:POKE1943+OQ,105:POKE 56215+OQ,6:NEXTOQ
75 POKEI,62:POKEII,1
80 POKEAB,0:POKEAC,1
81 PRINT"■■■SCORE="SC:PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■HI-SCORE"HI
82 IF F=1THEN200
83 IFU=1THEN230
85 IFKL=1THEN265
95 T=INT(10*RND(1)):IFT>8THEN295
100 TT=INT(10*RND(1)):IFTT>7THEN205
105 TR=INT(10*RND(1)):IFTR>7THEN246
110 RT=INT(10*RND(1)):IFRT>6THEN335
120 PE=PEEK(56321)
125 IFPE=254THENPOKEAB,32:POKEAC,1:AB=AB-40:AC=AC-40
130 IFPE=246THENPOKEAB,32:POKEAC,1:AB=AB-39:AC=AC-39
135 IFPE=247THENPOKEAB,32:POKEAC,1:AB=AB+1:AC=AC+1
140 IFPE=245THENPOKEAB,32:POKEAC,1:AB=AB+41:AC=AC+41
145 IFPE=253THENPOKEAB,32:POKEAC,1:AB=AB+40:AC=AC+40
150 IFPE=249THENPOKEAB,32:POKEAC,1:AB=AB+39:AC=AC+39
155 IFPE=251THENPOKEAB,32:POKEAC,1:AB=AB-1:AC=AC-1
160 IFPE=250THENPOKEAB,32:POKEAC,1:AB=AB-41:AC=AC-41
165 IF PE=239THEN185
175 POKEI,32:POKEII,1:I=I+1:II=II+1:IF I=2023THENI=1984:II=56256
180 GOTO 75
185 POKEW,32:POKEWW,1:W=0:WW=0:W=AB+40:WW=AC+40
```

```
187 POKE W,20:POKEWW,1
188 IF W+40=PTHENHH=40:LB=39:GOTO1000
191 IF W+41=OTHENHH=41:LB=42:GOTO1000
193 IF W+40=OTHENHH=40:LB=41:GOTO1000
194 IF W>1943THENPOKEW,32:POKEWW,1:F=0:GOTO75
195 F=1:GOTO83
200 W=W+40:WW=WW+40
201 IF W>1943THENPOKEW-40,32:POKEWW-40,1:W=0:WW=0:F=0:GOTO75
202 POKEW-40,32:POKEWW-40,1:GOTO187
205 REM:MOVE SHIP
210 IF H=0THEN215
211 GOTO75
215 P=1943:PP=56215:H=1
220 POKEO,63:POKEOO,1:POKEP,33:POKEPP,1:LA=40+P:MY=LA-920
221 IF LA-AB=40THEN315
222 IF LA=MYTHEN225
223 LA=LA-40:GOTO221
225 U=1:GOTO85
230 POKEO,32:POKEOO,1:POKEP,32:POKEPP,1
235 O=O-1:OO=OO-1:P=P-1:PP=PP-1
240 IF O=1903THENO=1942:OO=56214:H=0:U=0:TT=0:GOTO75
245 GOTO220
246 REM:MESSAGE
250 READ X:KI=1
254 IF X=999THENPOKEEW,32:POKETY,1:EW=EW+1:TY=TY+1:GOTO250
255 IFX=9999THENTU=55296:FORV=1024TO1024+40:POKEV,32:POKETU,1:TU=TU+1:
    NEXTV:GOTO 290
256 IF OP-AB=1THENPOKEOP,32:POKEPO,1:OP=1423:PO=55695:KL=0:J=J+1:SC=SC+10:
    GOTO268
257 POKEOP,X:POKEPO,1:LA=40
260 KL=1:GOTO120
265 POKEOP,32:POKEPO,1:OP=OP-1:PO=PO-1:YU=1
266 IF OP=1383THENOP=1423:PO=55695:KL=0:J=J+1:KI=0:GOTO75
267 GOTO 254
268 POKEEW,X:POKETY,1:EW=EW+1:TY=TY+1:KI=0:GOTO75
280 DATA 12,1,19,5,18,999,26,1,16,999,2,25,999,19,999,4,5,22,1,14,9,999,3,12
285 DATA 21,2,999,8,15,21,19,5,999,19,15,6,46,9999
290 EW=1024:TY=55296:RESTORE:SC=SC+1000:GOTO2000
292 IF W+42=PTHENEND
295 IL=I-80:LI=I-920:REM :LASER ZAP
300 JK=II-80:FORV=ILTOLI STEP-40:POKEV,23:POKEJK,1:IF V-AB=40THEN1300
305 FORG=1TO10:POKEV,32:POKEJK,1:JK=JK-40:NEXTV
310 JK=0:GOTO75
315 KF=P-40:FK=PP-40:REM: FIRE FROM SHIP
320 POKEKF,23:POKEFK,1
325 IF KF-AB=40THEN1100
330 KF=KF-40:FK=FK-40:GOTO320
335 REM:FELLOW MATES FALLING DOWN
340 ZN=1105:NZ=55377:MZ=1122:ZM=55394:LZ=1142:ZL=55414:PUT=ZN+800
345 POKEZN,0:POKENZ,1:POKEMZ,0:POKE ZM,1:POKE LZ,0:POKEZL,1
350 IF ZN+40=ABTHEN1300
355 IF MZ+40=ABTHEN1300
360 IF LZ+40=ABTHEN1300
365 POKE ZN,32:POKE NZ,1:POKEMZ,32:POKEZM,1:POKELZ,32:POKEZL,1
370 IF ZN=PUTTHENZN=0:NZ=0:MZ=0:ZM=0:LZ=0:ZL=0:GOTO75
375 ZN=ZN+40:NZ=NZ+40:MZ=MZ+40:ZM=ZM+40:LZ=LZ+40:ZL=ZL+40:GOTO345
1000 POKE W,32:POKEWW,1
1005 POKE W+LB,102:POKEWW+LB,1
1010 FORXX=1TO50:NEXTXX
1015 POKEW+HH,32:POKEWW+HH,1:POKEW+LB,32:POKEWW+LB,1:U=0:SC=SC+100:H=0:F=0
1020 P=0:O=1942:OO=56214:GOTO75
1100 POKE KF-40,201:POKE FK-40,1:FORTH=1TO100:NEXTTH
1200 PRINT"■■■
```

```
1215 IF HR$="N"THENEND
1220 GOTO1210
1225 IF(SC-HI)>1THENHI=SC
1230 SC=0:GOTO65
1300 POKE AB,201:POKEAC,1:FORTH=1TO200:NEXTTH:GOTO1200
1305 PRINT"■■■■■■■■■■■■■■■■■LASER ZAP"
1310 PRINT"■■■YOU ARE ONE OF THE SURVIVORS FROM"
1315 PRINT"WORLD WAR 3.YOU ARE RECALED TO BATTLE"
1320 PRINT"AGAINST THE EVIL FORCES LEAD BY TRI-X"
1325 PRINT"YOU HAVE BEEN TOLD TO WATCH OUT FOR THE"
1330 PRINT"ZAPPER AND TO DESTROY THE ENEMY SHIP"
1335 PRINT"YOU HAVE A FLEET OF ARMY ABOVE YOU WHO"
1340 PRINT"IF SHOT DOWN MIGHT COLIDE INTO YOU! AND ALSO CAPTURE THE LETTERS  "
1345 PRINT"■■■■■■■■■■■■■■■GOOD LUCK!!!!"
1350 PRINT"■■■■JOYSTICK IN PORT 1 OR USE THE KEYS"
1555 PRINT "■■■■■■■■■■■■CTRL■=BACKWARDS    ■←■=DOWN    "
1560 PRINT "■■■1■=UP  ■■■■2■=FORWARDS    ■SPACE■ TO FIRE  "
1565 PRINT"■■■■■■■■■■■■■■PRESS 'S' TO START■"
1570 GET RE$:IF RE$="S"THENPRINT"■■■■■■■■■■■■■■■■■■■■■■WAIT■":RETURN
1575 GOTO1570
2000 PRINT"■■■■■■■■■■YOU HAVE SURVIVED YOUR MISSION ELL DONE!"
2005 PRINT"■BUT NOW YOU MUST CARRY ON YOUR BATTLE"
2010 FORXXX=1TO500:NEXTXXX:GOTO70
```

Doubler

Andrew Tilley from Trowbridge sends this Vic 20 program

ANDREW'S program gives double sized characters on every letter and symbol on the Vic 20 keyboard.

Once RUN, the program takes 30 seconds to set up the magnified character set, since there are 3000 numbers to be poked in. You can then NEW the program and use the new character set.

POKE 36865,20 can be used to centralise the screen, otherwise you may not be able to see the cursor position. Simple but extremely effective.

```
10 A=5120:Z=5120
19 B=PEEK(A+27648)
20 POKEZ,B
30 Z=Z+1
40 POKEZ,B
50 A=A+1:Z=Z+1:IFZ>7678THEN70
60 GOTO19
70 POKE36869,253:POKE36867,PEEK(36867)OR1:
```

Space Mines

Kevin Hughes sends this program for the unexpanded Vic 20

SPACE MINES is a version of Lunar Lander. You must guide your spaceship through the mines to a safe landing, using the joystick. After three safe landings you get a bonus take-off, where you score points by ramming the mines and docking with your mother ship.

You can use the <and> keys to control the ship if you prefer. Press A or the fire button to abort, and beware of extra dangers such as the black mine. Tread very carefully.

```
10 PRINT"■":POKE36879,221
15 PRINT:PRINT
20 PRINT"  ▗▀▖ ▗▀▖ ▗▀▖ ▗▀▖ ▗▀▀"
25 PRINT"  ▌  ▌ ▌▐▄▟ ▌  ▀▖ ▌  "
30 PRINT"  ▝▀▖ ▛▀▘ ▌▝ ▗▄▘ ▀▀"
35 PRINT"  ▟▄▘ ▌   ▌ ▌ ▝▄▘ ▗▄▘"
40 PRINT"■■■■■"
45 PRINT"      ▗▀▖INES"
50 PRINT"■■■■  BY KEVIN HUGHES"
```

```
60 PRINT"■■■ HIT A KEY WHEN READY"
70 FORI=125TO30STEP-1:N=N+1:POKE36865,I:POKE36878,15:POKE36876,128+N:FORJ=1TO40:
NEXTJ,I
75 POKE36876,0
80 GETA$:IFA$=""THEN80
100 POKE36879,8
110 FORT=0TO1000:READA:IFA=-1THEN195
119 POKE7168+T,A:NEXTT:
150 DATA 16,24,20,18,255,80,48,16,0,0,44,127,255,255,255,255
160 DATA 0,0,0,0,0,0,32,0,0,0,24,36,126,255,129,189,0,153,129,90,126,24,24,255,24,60
170 DATA 219,126,66,126,195,231,155,255,0,0,248,96,48,24,55,127
180 DATA 0,0,0,0,8,60,254,254,8,24,40,72,255,10,12,8
190 DATA 0,24,24,60,255,126,255,255,-1,0,0,0,0,0,0,0,0
195 FORT=0TO7:READA:POKE7424+T,A:NEXT
200 PRINT"■":POKE36879,8:POKE36869,255
210 PRINT"■■■■  GRAPHIC SYMBOLS    "
215 PRINT
220 PRINT"■ @  ■■LASER"
221 PRINT
225 PRINT"■ A  ■■PLANET SURFACE"
226 PRINT
230 PRINT"■ B  ■■STARS (HARMLESS)"
231 PRINT
235 PRINT"■ C  ■■LANDING CRAFT"
236 PRINT
240 PRINT"■ D  ■■MINES (DEADLY)
246 PRINT
250 PRINT"■ E  ■■LANDING PAD
256 PRINT
260 PRINT"■ FG ■■MOTHER SHIP
266 PRINT
270 PRINT"■ I  ■■LASER TOWER"
276 PRINT
277 PRINT"■■■■ HIT A KEY WHEN READY"
278 GETA$:IFA$=""THEN278
310 PRINT"■":POKE36879,26:POKE36869,240
320 PRINT"■■■■INSTRUCTIONS (Y/N)
330 GETA$:IFA$=""THEN330
340 IFA$="Y"THENPRINT"■":GOTO370
350 IFA$="N"THENPRINT"■":GOTO7000
360 GOTO330
370 PRINT"YOU ARE GUIDING YOUR  SHIP DOWN TO THE      SURFACE OF THE RED    PLAN
ET.
375 PRINT
380 PRINT"YOU HAVE TO MISS      THE MINES AND LAND    YOUR CRAFT SAFELY ON  LAND
ING PAD
385 PRINT
390 PRINT"FOR EACH SUCESSFUL    LANDING YOU GET 10    POINTS.
395 PRINT
400 PRINT"AFTER THREE           CONSECUTIVE LANDINGS  YOU GET A BONUS TAKE  OFF.
405 PRINT
410 PRINT"■ HIT A KEY WHEN READY"
420 GETA$:IFA$=""THEN420
430 PRINT"■"
440 PRINT
445 PRINT"HERE YOU SCORE BY     RAMMING THE MINES     (10 POINTS PER MINE)"
450 PRINT
455 PRINT"YOU MUST RETURN TO    YOUR WAITING MOTHER   SHIP TO AVOID LOSING  A LI
FE"
460 PRINT
465 PRINT"ALSO IF YOU DRIFT     INTO THE LASER RAYS   THEN YOU WILL AGAIN   PERI
SH"
470 PRINT
475 PRINT"BEWARE                                      THE BLACK MINE !"
480 PRINT"■■ HIT A KEY WHEN READY"
490 GETA$:IFA$=""THEN490
500 PRINT"■"
505 PRINT"■■■       CONTROLS"
510 PRINT"■■■  < > LEFT & RIGHT"
520 PRINT
```

```
525 PRINT"■    A FOR ABORT"
530 PRINT"■■■■■      OR JOYSTICK"
535 PRINT"■■■■ FIRE BUTTON TO ABORT"
540 PRINT"■■ HIT A KEY WHEN READY"
550 GETA$:IFA$=""THEN550
7000 PRINT"■"
7010 STOP
```

Jellypuss

P H Armstrong sends this Vic 20 game from Caterham

THE OBJECT of Jellypuss is to get your diver safely to the marine castle.

Blocking your way are a variety of nasty submarine creatures, and to avoid them you must use the keys A and D to move left and right.

You'll hear a sound effect every time you reach the castle.

Program notes

0; sets sound effects
1; GOSUB to hi-res graphics
3; GOSUB to instructions
5; clears screen, sets score to 0
6; GOSUB to routine setting number of lives you require
350-630; sets up main title
631; music for start of game
640; prints score and lives
670-700; prints five Jellypusses in random positions
710-720; prints castle in random position
740-760; prints diver
770; tests to determine whether diver has reached bottom of screen
772; tests to see if lives = 0
780-790; moves diver
800-880; tests to see if diver has collided with Jellypuss
890-950; tests to see if diver has reached the castle
2000-2020; another go?

You can alter the number of lives allowed by modifying 5000-5052.

```
0 V1=36878:S1=36876
1 GOSUB3000
3 GOSUB6000
5 PRINT"■■":POKE36879,45:SC=0
6 GOSUB5000
340 PRINT
350 POKE36878,15:POKE36876,180:FORT=1TO400:NEXT:POKE36876,0
600 PRINT"■":POKE36869,255:PRINT"■■■■■■■■■■JELLYPUSS"
610 PRINT"■■■■■■■■■■BY HA■"
620 PRINT"■■■■■■■■■■HIT■ ■ANY■ ■KEY■"
630 GETA$:IFA$=""THEN630
631 PRINT"■":FORPU=15TO0STEP-1:POKE36878,PU
633 FOROH=1TO00:NEXT
634 FORIW=220TO240:POKE36876,IW:NEXT:NEXT
640 PRINT"■■SCORE=";SC:PRINT"■■■■■■■■■■■LIVES=";LI:POKES1,0
670 FORL=1TO5
675 E=INT(RND(1)*190)+7834
680 POKEE,1:POKEE+1,2:POKEE+21,3:POKEE+22,4:POKEE+23,5
690 POKEE+43,6:POKEE+44,7:POKEE+45,8
700 NEXTL
710 D=INT(RND(1)*123)+7885
720 POKED,11:POKED+1,12:POKED+22,13:POKED+23,14
740 H=7713
750 POKEH,9:POKEH+22,10
760 H=H+22
770 IFH>8164THENLI=LI-1:GOTO640
772 IFLI=0THENPRINT"■■YOUR SCORE=■";SC:GOTO2000
775 FORT=1TO30:NEXT:POKEH-22,32
780 IFPEEK(197)=18THENH=H+1:POKEV1,15:POKES1,190:POKEH-1,32:POKES1,0
790 IFPEEK(197)=17THENH=H-1:POKEV1,15:POKES1,190:POKEH+1,32:POKES1,0
800 IFPEEK(H+22)=1THENLI=LI-1:GOTO640
810 IFPEEK(H+22)=2THENLI=LI-1:GOTO640
820 IFPEEK(H+22)=3THENLI=LI-1:GOTO640
```

```
830 IFPEEK(H+22)=4THENLI=LI-1:GOTO640
840 IFPEEK(H+22)=5THENLI=LI-1:GOTO640
850 IFPEEK(H+22)=6THENLI=LI-1:GOTO640
860 IFPEEK(H+22)=7THENLI=LI-1:GOTO640
870 IFPEEK(H+22)=8THENLI=LI-1:GOTO640
880 IFPEEK(H+22)=9THENLI=LI-1:GOTO640
890 IFPEEK(H+22)=10THENSC=SC+10:POKES1,230:GOTO640
930 IFPEEK(H+22)=11THENSC=SC+10:POKES1,230:GOTO640
940 IFPEEK(H+22)=12THENSC=SC+10:POKES1,230:GOTO640
950 IFPEEK(H+22)=13THENSC=SC+10:POKES1,230:GOTO640
1000 GOTO750
2000 PRINT"■■■ANOTHER GO?"
2010 POKE198,0:INPUTG$:IFG$="Y"THENGOTO5
2020 IFG$<>"Y"THENPOKE36869,240:PRINT"■":END
3000 PRINT"■■■■■■■PLEASE WAIT■":FORA=0TO511:POKE7168+A,PEEK(32768+A):NEXT
4040 DATA0,0,240,16,32,224,64,88
4050 FORB=7168TO7175:READC:POKEB,C:NEXTB
4070 DATA0,0,0,0,0,32,32,19,0,0,0,0,0,0,128,128,0
4080 FORD=7176TO7190:READE:POKED,E:NEXTD
4090 DATA3,0,0,6,1,0,0,1,20,156,99,34,255,41,41,145
4100 FORF=7191TO7205:READG:POKEF,G:NEXTF
4110 DATA0,0,192,106,0,0,0,0,1,1,0,0,0,0,0,0
4120 FORH=7206TO7220:READI:POKEH,I:NEXTH
4130 DATA16,8,0,0,0,0,0,0,192,0,0,0,0,0,0,0
4140 FORJ=7221TO7235:READK:POKEJ,K:NEXTJ
4160 DATA0,24,36,189,189,124,60,60,36,36,36,102,0,0,0,0
4170 FORL=7236TO7250:READM:POKEL,M:NEXTL
4190 DATA168,248,248,248,216,216,216,221,21,31,31,31,27,27,27,91
4200 FORN=7251TO7265:READO:POKEN,O:NEXTN
4220 DATA255,255,207,206,206,206,254,254,255,255,243,115,115,115,127,127
4230 FORP=7266TO7287:READQ:POKEP,Q:NEXTP
4250 RETURN
5000 PRINT"■■HOW MANY LIVES(1-4)"
5010 INPUTFH$
5020 IFFH$<"1"ORFH$>"5"THEN5010
5030 IFFH$="1"THENLI=1:RETURN
5040 IFFH$="2"THENLI=2:RETURN
5050 IFFH$="3"THENLI=3:RETURN
5052 IFFH$="4"THENLI=4:RETURN
5060 RETURN
6000 PRINT"■■■■■■INSTRUCTIONS■"
6010 PRINT"■■■YOU ARE A DIVER"
6020 PRINT"■■■WHO HAS TO GET"
6030 PRINT"■■TO THE MARINE CASTLE"
6040 PRINT"■■■SAFELY,AVOIDING"
6050 PRINT"■■■THE JELLYPUSS"
6060 PRINT"■■■■■■■CONTROLS■"
6070 PRINT"■■■■■■■A - LEFT"
6080 PRINT"■■■■■■■D - RIGHT"
6090 PRINT"■■■■■■■HIT A KEY■"
7000 GETJG$ IFJG$=""THEN7000
7010 RETURN
```

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cass= cassette **disk**= diskette **R**= rom

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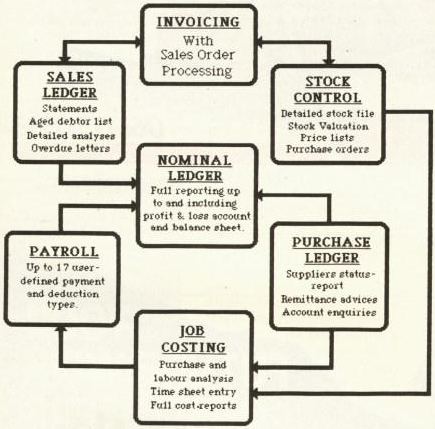

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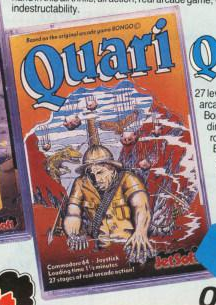

Quari 27 levels of increasingly difficult real arcade action. Based on the game Bongo, you must avoid the chasing dinosaur, pterodactyls, falling rocks, native spears and bouncing Bongos. Negotiate rope bridges and erupting volcanoes, picking up the treasures of a lost civilisation as you go – and finally cage the dinosaur – if you can!

FAST LOAD 1½minutes

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Mind Stretchers?

Book: *Commodore 64 Mind Stretchers*
Author: *Ian Creasey*
Publisher: *Sigma*
Cost: *£6.25*
Reviewer: *Dafna Erskine*

This book contains a mixture of games and utilities — some 40 programs in all. There is a sprite editor, a character editor and old favourites like Mastermind, Snake, Life and Poker.

There is nothing particularly wrong with this book, except that it is two years late. The days when you could put out books of '40 best programs for your . . .' are long gone. Micro users are now much more discriminating.

Given the flood of computer books over the past year, there is surely little scope for titles which do no more than bundle collections of programs together. More imagination please.

Beginners guide to the Vic 20

Book: *The Incredibly Easy Way To Program Your Vic 20!*
Author: *Peter Stanhope*
Publisher: *Interface*
Price: *£3.95*
Reviewer: *David Shepherdson*

If you've struggled with the manual, then this is the book you've been waiting for! That's how the book starts off, and it indicates what level it is aiming for; but if you have mastered the manual, don't let that put you off considering this book. It is one of the best I have yet seen from Interface. Like many of their books, it is well printed and prepared, it is very easy to read and easy to follow, even for an absolute beginner. Unfortunately it does have about two printers errors in each of the 12 chapters, but that shouldn't spoil your enjoyment. Also, the author has a refreshing sense of humour which shows that he has enjoyed writing the book.

The book has been set out with plenty of example programs, with lots of **bold** print for emphasis, and throughout the book large clear print is used; so if you've been staring into a screen for hours, this book shouldn't give you any problems.

Stanhope takes you from simple things like how to set up your new computer, use of the cassette and keyboard, through to how to make the most of PEEKs, POKEs and Strings, and also touches on the available peripherals.

The author himself states this is a book for the absolute beginner — well, it is, but it could also be a valuable addition to anyone who has perhaps moved up to a Vic. The programs included range from simple conversion programs to Hi-res and educational games. Considering the price of many books these days, you could do a lot worse than buying this one.

After the arcade

Book: *Working With Easy Script*
Author: *Randall McMullan*
Publisher: *Granada*
Cost: *£5.95*
Reviewer: *Shiela Ross*

When arcade games begin to lose their thrill, when the thought of zapping yet another alien begins to pall, most micro users turn towards more serious applications. Perhaps the most common serious use of micros is word processing. For 64 owners, this generally means *Easy Script,* which is Commodore's own brand word processor for the 64.

In *Working With Easy Script,* Randall McMullan adopts a straightforward approach, encouraging the reader to start word processing immediately and learn by doing. All the basic commands are here, from inserting and deleting text to mail merge and page size. There is even a sample letter from Mark Carrington to JR Ewing — Randall McMullan must be a *Dallas* fan!

This book will be more useful for beginners than for experienced users, but there is something for almost everyone. The only real criticism is that the section on printers and print effects is rather skimpy, but then it is a topic which deserves a book in its own right.

Advanced handbook

Book: *The Advanced Commodore 64 Handbook*
Authors: *Peter Lupton and Frazer Robinson*
Publisher: *Century*
Cost: *£6.95*
Reviewer: *Phil Bonner*

Let us suppose you are an enthusiastic user of a 64, who is proficient in Basic and would like to go further. You have examined Commodore's *Programmer's Reference Guide* but find parts of it too technical. You would particularly like to experiment with sound and Hi-res graphics, in Basic and Assembler, to understand the Basic Interpreter and to add a few extra commands to Basic. The trouble is that you have been unable to find a suitable book to assist you.

Look no further! This superb volume is the very thing you need. Intended as a companion to the *Commodore 64 Handbook* by the same authors, it stands on its own as a well-written, informative and useful volume for any 64-owner's bookshelf. As well as covering the points mentioned earlier, it provides a comprehensive guide to the use of disks and printers in a manner far superior to Commodore's own offerings. Add to this numerous listings of program examples and utilities, and you have a publication which is hard to resist.

This is indeed a book to dip into at random and explore in depth. It is packed with information presented clearly and logically, with several helpful appendices. It would almost be worth £6.95 for the Hi-res routines alone. My only criticism is of the index, which is practically non-existent, but compared with the rest of the book this is a minor irritant. Highly recommended!

Learning with Adventures

Book: *Learning With Adventure Programs*
Author: *Rosetta McLeod*
Publisher: *Melbourne House*
Cost: *£6.95*
Reviewer: *Jeremy Simon*

Computers in education is a much abused phrase. While computers are often used in schools, it is usually for administration or computer studies. There are depressingly few instances where computers are used in English, geography or biology.

However, Rosetta McLeod has set out to show how computers can be used to teach a variety of skills including logic, use of English and map drawing.

Concentrating on four commercially available adventures — *The Hobbit, Valhalla, The Quill* and *Snowball* — Rosetta McLeod explains how parents and teachers can set exercises and tests which draw on popular computer programs. For example 'Write a review of *The Hobbit* for inclusion in a computer magazine'.

The book is illustrated with pictures and examples taken from Rosetta McLeod's pupils in Aberdeen. An extremely interesting and worthwhile book, if a little pricey at £6.95.

Ten out of ten for Rosetta McLeod

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ANSWER BACK

Standard abbrs.

WHEN TYPING in a program recently I discovered that standard abbreviations used in REM statements produce strange but consistent results when listed. P (Shift) 0 gives not POKE but PDATA for instance. How and why does it happen? And can Turbo loading programs such as a Fastback damage the computer in any way?
P Dent
Seaham

ALL UNSHIFTED characters after a REM will list correctly, but any produced by shifting those keyboard characters which produce graphics when shifted are interpreted as tokens, and converted into keywords. You can avoid this by placing them within quotes.

Thus when you enter P (SHIFT) O, the P is unchanged and the shifted O is converted into the keyword DATA. On other CBM machines the conversions may be different. However, if you use a line (on the 64 or any other Basic 2 machine) such as 10 REM 'shift' L, then all data after the shifted L will vanish, and the rror message 'Syntax Error' will appear when listed.

I haven't heard of any damage being caused by turbo loaders, although I haven't tried the Fastback program you mention.

Restore line

I HAVE a book called *More Basic Computer Games,* and cannot make the longest game work because it uses RESTORE (line number) commands. I've tried a number of different ways of presenting these commands, but my 64 won't accept them. Can you help?
D Gill
West Timperley
Cheshire

SOME Basics have the command "RESTORE" line number" — CBM Basic does not. The data pointer is set to that line, not to the earliest DATA statement as is the case in Commodore Basic. You will have to amend the READ routine, and also use a marker as the first item of DATA on the line you wish to RESTORE.

```
10 READA$:IFA$<>
   "marker" THEN FOR
   I=ITO10:READA$:
   NEXT:GOTO10
20 READ A$
30 rest of program
40 data tag,1,2,3,4,5,6,7,8,
   9,10
50 data marker,11,12,13,14,
   15,16,17,18,19,20
```

64 to 3000

WILL YOU let me know if there is any hardware available which will let me use a Commodore Series 3000 disk drive and printer with my 64?
Ian Brydon
Farnham
Surrey

THERE ARE several suitable interfaces available, for instance the CBM64 IEEE 488 cartridge, price £59 plus VAT from JCL, 47 London Road, Southborough, Tunbridge Wells, Kent, phone 0892-27454. This allows the 64 to access and control all CBM IEEE peripherals. The cartridge plugs into the rear of the 64 and accepts a standard PET IEEE lead to connect to the first peripheral. Subsequent devices are daisy chained with standard IEEE/IEEE leads.

However, if the software you are running uses the space from $C800 to $CFFF then you cannot use this cartridge. In that case you might want to investigate the DAMS interface or the Interpod, now handled by Cheetah marketing and featured in October's *Commodore Horizons.*

PRG for paddles

CAN YOU give a short routine explaining the use of paddles? I have a pair lying around the house doing nothing because I don't understand how to use them!
Russell Barr
Backhead
Glasgow

THE ROUTINE for using paddles is rather long and incorporates some machine code. You'll find it listed and explained on pages 346-347 of the Commodore 64 Programmers Reference Guide.

Finding the address

IN THE August issue of *Commodore Horizons* there was a program called ADDRESS by Chris Payne. In order to get the program to work effectively, large amounts of data need to be stored on tape. Could you make some suggestions on how to arrange and store the required amounts of data, or suggest some books which explain data handling in full?
W Purewad
West Bromwich
Midlands

***Business Applications for the Commodore 64,* by James Hall, published by Sunshine, should be of great help to you. It contains programs and subroutines which deal with data handling both on disk and tape.**

Flashes and crackles

I HAVE recently purchased a Vic 20 for my son, and have been picking up interference on the screen, showing up as short flashes and crackles. The TV and the computer itself appear to be OK, but as we are about half a mile away from a Plessey factory it seems that the Vic is picking up some sort of signal. Can you suggest any way to shield or insulate it?

TRY A surge protector plug, which eliminates voltage surges on the mains. This could be caused by your bering on the same circuit as Plessey's, or a local hospital, or even other electrical appliances in your own house. You can obtain such a plug for £12.00 from Bowthorpe EMP Ltd of Stevenson Road, Brighton, Sussex, BN2 2DF.

Expander in print

I HAVE RECENTLY purchased a Vic 20 with Super Expander, and I find it very hard to find any programs utilising the expander. Could you suggest any books?
Karl Sorrell
Tilgate
Sussex

YOU CAN find many programs using the Super Expander in a book called *Vic Graphics* by Nick Hampshire, costing £6.95 from Duckworths, The Old Piano Factory, 43 Gloucester Crescent, London. All the programs in the book are also available on cassette from the publishers.

Cobol query

I AM A relative newcomer to the world of computers, but I anticipate going to college later this year to take a fulltime course.

I've been told that it would be a help if I could gain some experience in Cobol, but I can't trace a supplier of a version of this language. Can you help?
Michael Fox
Kingsbury
London

COBOL on the 64 could only be used in conjunction with the new Commodore CP – M cartridge. CP – M is an operating system which allows access to a wide range of business programs, and you should be able to find a suitable version of Cobol once this cartridge is fitted. Unfortunately, at the time of writing, no firm release date has been set for the Commodore CP/M cartridge.

If you need help with a technical query or problem write to Jack Cohen, Commodore Horizons, 12-13 Little Newport Street, London WC2R 3LD

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ANYONE INTERESTED in a multi-colour Sprite generator, a HI+RES drawing aid, a complete Database and a Budget program for the CBM 64? If so send a blank tape and a cheque or P.O. for £3.95 (to address below). If no blank tape enclose 50p extra. Allow 28 days for delivery, enclose 20p p+p. Gary Brennan 12 Bowmore Walk, Shotts, Strathclyde, Scotland ML7 5JN.

FORBIDDEN Forest, Aztec Challenge, Grid Trap and more for the CBM 64. For sale or exchange. Send SAE for full list. Finn Choong, 11 Winleigh Road, Handsworth Wood, Birmingham B20 2HN.

SPECIAL OFFER for Commodore Horizons readers. Buy your VIC 20+16K stock control at cost price, only £8.50 with free data tape & full documentation. This month only. Martyn Carrick, Wilson Hill Farm, Skidby, Cottingham HU16 5SR.

CBM 64 Software to exchange/sell. Titles include: R.A.C., Decathlon, Boss, Assembler, Beach Head, and much more. Garry Tan, 18 Wragby Close, Bury, Lancashire BL8 1XD or Phone: 061 761-4605 after 7.15 p.m. ask for Garry.

FOR SALE the Hobbit and Solo Flight for CBM 64. Both new and unused. £10 each. Tel: (073 72) 42348 after 6 p.m.

CBM 64 PROGRAMS to swap or sell. Many titles including American. Write to Stephen Kearon, 22 Westminster Lawns, Foxrock, Dublin 18, Ireland. Tel: Dublin 885634.

CBM 64 Software to swap. Have many titles, including some American. Example Zaxxon, One on One. Send list to Garry, 22 Dauntsey Mews, Bellvale, Liverpool L25 2TG Merseyside, all letters replied.

COMMODORE 64 software for sale. Wimbledon £4.50, Siren City £3.50, Star Commando £4, Hustler £3.50. Together sell for £13.50. Contact S. Sung, 1 Hurly Hawkin, Bishopbriggs, Glasgow G64. Send SAE with postal order if sold, money returned.

VIC 20 games for sale. Computer War, T of Evil, Sub Commander at £5 each. Snooker £6. Skramble, Jetpac, Arcada, The Wizard and Princess K-tel, doublesider Amok, Race, Tornado, Gridrunner and Roadrace cartridge £1. Ring Daemon on Stourbridge 392046 any time after 6.30 p.m.

COMMODORE 64 software for sale, most half price: Zaxxon £15, Jumpman £15, Acos + £4, Easy Script £30 original condition. Also wanted: Ringside Seat, Seat, Mule, Combat Leader, Axis Assassin, Worms, might swap. Tel: Waterloolville 266855 after 6 pm.

COMMODORE 64 with cassette, Joystick, Software only ten weeks old £180. Tel: 01-670 9872.

NEW from Rocket Concepts: Mastercode — a game of logic; Robotron Attack and Space Station — arcade games; only £2.95 each. Also Stock Control and Telephone Directory programmes — for business and home use — both only £7.95 on disc or £5.95 on tape. For orders or info contact Ian Hooper, 26 Lordship Pk, London N16 5UD. Tel: 01-800 7171.

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FOR VIC 20. I have 130 programs. You can buy or exchange them.My programs are: Gridrunner, Slot Machine, Amok, Abductor, Slalom, Sintetizzatore Vocale, Anti Save, Formula 1, Sargon, Chess, Zombies, Rat Race, Gorf, Camel etc. Silvio Polacco, Molveno Street, 00135, Rome, Italy.

CBM 64 Software half price. Practical 64 disc £20. Data Manaser cassette £10. Data Manaser disc £10. Ultysinth 64 cassette £8. Tel: Walton on Thames (0932) 241242.

CBM 64 Software for sale or swap £65 worth of software including Hobbit, Manic Miner, Voodoo Castle all originals on cassette. The lot for £30 or nearest offer. Phone: (0472) 40088 and ask for Steve or write to 9 Harrington St., Cleethorpes, Sth Humberside DN35 7AY. Tel: 0472 40088

CBM 64 software sale DFM database and labels (£30) £18. Turbo extended basic (£14.95) £10. Pilot 64 (£7.95) £4.50. Ripspeed 64 (£7.95) £4.50. Postage 50p. Tel: 01-590 2792.

FOR SALE Radar Rat Race and Omega Race for VIC 20. Both unused — already got copies of both £5 each or £9 the pair. Phone Nik on 07694 457 after 6p.m.

VIZAWRITE and VIZASPELL on disk for Commodore 64 list £80 new, £60 the pair. Phone Dave 0787-60148 also Jumpman for sale £10.

ADVENTURE GAMES, computer games, £3.50 each! For free leaflet send s.a.e. to 31 Goddington Rd, Bourne End. EASY SCRIPT W.P. package, for CBM 64 disk. Unopened, offers Forest Rolo 3200 evenings.

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COMMODORE 64, C2N cassette, joystick, four books, dust cover, machine code book and tape plus £300 worth of top software, Hobbit, Decathlon, Solo Flight and many more. All boxed and as new £360, can deliver. Tel: 0630 57129.

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VIC 20 for sale with Choplifter by Creative Software and Jelly Monsters (Pac-Man) by Commodore and also with intro to basic and Quickshot 1 joystick, all for £80. Willing to go lower than £80. Phone: London 472-2002 anytime ask for Mr B Jean-Pierre.

VIC 20 with cassette recorder + switchable 16K Ram pack, Mathematic-S 1 + £50 worth of games + Victape 1, 2, 3 + HI-RES drawings with maps of the World and map of England. Books like VIC 20 Exposed, Getting the Most From Your VIC 20 and more. All of this for £200. I sell for only £200 + p&p send to Habib Allahi, 6 Colville Villas, off Colville St, Notts NG1 4HN.

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1984 VIC 20 data set + 2 month old 16K Vixen switchable Ram pack (3-8-16). 2 books. £45 of software + 1 cartridge. Sell complete, £180 ono. Contact S. Shaw, Aljun-Trio, 12 Lemon Grove, Whitehill, Bordon, Hants GU35 9BE. Tel: Bordon 3683.

VIC 20 home computer with cassette unit, magazines, intro to basic pack 1 and games. £120 ono. Tel: Aylesbury 22310.

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1984

A VINTAGE YEAR FOR COMMODORE HORIZONS

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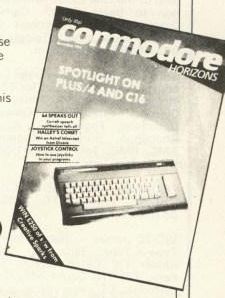

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FINNISH 64 user wishes to swop or buy CBM 64 software on disk. Please send your list to: Peter Abbott, PO Box 47, 02660 Espoo 66, Finland.

COMMODORE 64 software to swap. Top British and American titles available. Phone Graeme on 0365 23367.

COMMODORE 64 software to swap, many tiles including American. Contact Garry on 051-487 3262 or write to 22 Dauntsey Mews, Bellevale, Liverpool L25 2TG, Merseyside.

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CBM 64 software to swap or sell. Titles include the Hobbit, Valhalla, Scramble 64, A.M., Camels and many more. Send s.a.e. for list of these excellent games, 34 Wilton Gardens, Cork, Ireland.

WANTED 1541 disc drive for Commodore 64, plus any extras i.e. manuals, discs, and games if possible? Price negotiable, about £125. Phone Stevenage 359583 and ask for Tony, evenings.

WANTED Oxford Pascal Disk swap, S.A.M Speech Synthesisor or Simons Basic or games on disk. Write B. Bradley, 54 Ashwood Rd., Clondalkin, Dublin 22, Ireland.

1525 PRINTER manual wanted. Photo copy will suffice. Contact Terry Hart, 17 Burns Gardens, Lincoln. Tel: 29643 or 29931, ext 369.

WANTED Mastercode Assembler £5, F-15 Strike Eagle £6, Spitfore Ace £4.50, Hobbit £6, Flip Flop £4.50, Kotoni Wilf £3.50, Valhalla £5, Boulder Dash £4, Quo Vadis £4. Phone Dave (0734) 785130.

I WOULD like to join a Commodore 64 Users Club within 5 miles of Stretford, Manchester, if there is such a club. Please contact Gary Knowles, 50 Norway Street, Gorse Hill, Stretford, Manchester. 061-864 1884 evenings.

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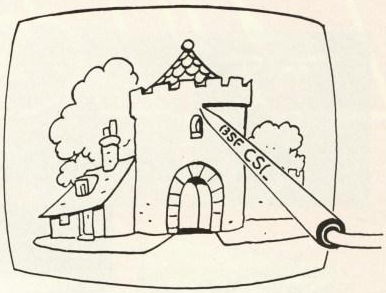
- Save/load your latest master piece to/from the disk/tape drive
- Or directly copy the drawing on the screen to the printer! And keep it for ever or send to a friend as a post card!
- Design your own colourful sprites and characters
- Play the games in the package! or use the light pen in your own games/education/programs



GRAPHKIT is available on disk and tape. Tape version is £1595 and disk version (recommended) is £19.95.

All you 1540/1541 disk users **DMON**! Is here at last. Dmon is the disk monitor you have been waiting for it will allow you to:

- read/write blocks from/to the disk
- display and edit blocks on the screen
- display and send disk messages/commands
- transfer your programs from tape to disk or disk to disk or even disk to tape! ● and more!

DMON comes on DISK at only £9.95.

Do you use tapes? Are you sick and tired of waiting for your programs to be Loaded/Saved from/on the tape? Then you need a **TORNADO**!! Tornado allows you to Save/Load/Verify your Basic/machine code programs faster than a CBM 1541 disk drive does! Due to popular demand! Tornado now comes with new and more powerful commands plus extra instructions to assist you in making fast versions of your existing machine code/Basic programs. Tornado is available on tape for CBM 64 and 8K + Vic 20.

Do your Run/Stop and Restore keys often fail? Do you want to come out of those crashes?! Or get into those unbreakable programs?! Then what are you waiting for, get yourself a **BREAKER**!! Reset switch and let your computer know who is the boss!! Breaker can be connected to your machine in seconds, no soldering. Included with the Breaker is a copy of basic recovery software on tape. Now available for any CBM 64 or Vic 20.

A FREE BREAKER WITH EVERY TORNADO IF YOU USE THE COUPON BELOW NOW!

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Please send me .....Tornado at £9.95 + my free! Breaker

Please send me .....Breaker at £7.95

Please send me .....Rom-File at £7.95

Please send me .....Lightpen at £11.95

Please send me .....Graphkit at £15.95 (tape)

Please send me .....Graphkit at £19.95 (disk)

Please send me .....DMON at £9.95

I enclose cheque/PO/cash to the sum of £.....

Name.....Computer.....

Address.....

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Tel.....

Please use this form and block letters only. All prices are inclusive of p&p (mail order only, add £2 if outside UK). Please post to:
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Eureka!

Win one of ten CURRAH Speech 64 units

ARCHIMEDES, the Greek mathematician, is the inspiration for this competition sponsored by **Domark**, the company responsible for the remarkable new multi-part adventure **Eureka!**

Ten prizewinners will receive Currah Speech 64 voice synthesizers, for the Commodore 64. This unit, reviewed in last month's Commodore Horizons, "speaks" in four different voices and can be programmed in Basic to produce any words you want.

Since the prize is so talkative, the competition is all about words — how many English words of four letters or more can you make from the name ARCHIMEDES?

No proper names, plurals, or abbreviations are allowed. When you've completed your list, fill in the competition form and post it to the address given. Don't forget to complete the tie-breaker in an apt, amusing and original manner in 15 words or less.

The ten entrants who give the largest correct lists of words will win the speech synthesisers.

Usual competition rules apply, and the Editor's decision is final. Closing date is the last working day of December.

I DISCOVERED [ ] WORDS. THEY ARE: _____

_____

_____

_____

_____

Use extra paper if necessary

_____

_____

TIEBREAKER: Speech 64 says it all because . . .

_____

_____

NAME: _____

ADDRESS: _____

_____

POST TO: Eureka Competiton, Commodore Horizons, 12/13 Little Newport St., London WC2R 3LD.

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COMMODORE 64

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From the author of Percy Penguin, Mr. Wiz is a superb arcade-type multi-scene game. Guide Mr. Wiz around the garden to eat the cherries whilst avoiding the evil gremlins. The gremlins can be killed by dropping apples on them or by throwing the crystal ball. Extra points can be gained by eating the magic mushroom, but beware ... this is the home of the gremlins and makes them permanently furious!
(KEYBOARD OR JOYSTICKS)

●●●*NEW RELEASE*●●●

"MR. WIZ" IS ALSO AVAILABLE FOR THE B.B.C. MICRO AND ACORN ELECTRON, AND "WORLD GEOGRAPHY" IS AVAILABLE FOR THE ACORN ELECTRON. ALL CASSETTES ARE £7.95 INCLUDING VAT AND P.&P.

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36 Demos DR 5/5

THE BIG THREE

THREE ESSENTIAL PACKAGES CAN BE YOURS FOR WELL UNDER THREE FIGURES!

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With most database systems, you only get out what you put in. Micro Magpie gives you more! It can manipulate data between different files, perform calculations on numerical data, print out reports, and hardcopy data in graphical form. Only Micro Magpie can give you all these features . . .

* Fully user programmable database management system.
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* 100% machine code program for speed and compactness.
* Can perform complex calculations on numerical data.
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Micro Magpie would be excellent value if you bought it for the applications alone! You can have a highly sophisticated Mailing List system up and running within minutes, and you'll still be using only a fraction of Micro Magpie's potential! Once you start tailoring your own custom applications, you will begin to discover why Commodore User magazine called Micro Magpie "the software bargain of the year"!

MICRO MAGPIE - ON DISK ONLY

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Micro Swift - the affordable professional spreadsheet system for the Commodore 64. Micro Swift will prove indispensable in business or around the home to construct models of income and expenditure; for carrying out instant 'what-if' calculations to see how a change in one or more figures affects all the other figures; or for specialised applications where complex number crunching is required.

Micro Swift is unique in that it is operated by pop-up menus, a system pioneered by our Magpie database program. No longer do you have to memorise a whole hierarchy of commands and control keys - the menus appear when you want them, and disappear when you don't.

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* A1 to Z254 cell matrix.
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Micro Wordcraft is our new disk-based professional word processor. It is a direct descendant of the highly respected Wordcraft program, which is in use world-wide on the larger Commodore machines, Sirius, and IBM PC, etc. Written in 100% machine code, Micro Wordcraft spells affordable office quality word processing for the home or business user.

It is often said that "you get what you pay for"; but with the Audiogenic Professional Series you get what you pay for and more!

Micro Wordcraft gives you all these advanced facilities . . .

* Full text control - document width up to 99 columns, tabs, decimal tabs, justification and centering.
* Full text manipulation - on-screen editing, block move, block delete, string search and replace, underlining and emboldening.
* Scrolling screen display, uncluttered by control characters.
* Name and address files can be created and merged into standard letters.
* Easy merging of standard paragraphs. Compatible with Commodore, parallel and RS232 printers.
* Integral Centronics interface for parallel printer option.
* Instantly accessible Help screens.
* Comprehensive instruction manual included.

The name and address merging capabilities of Micro Wordcraft make it an ideal tool for small businesses, clubs, societies or hobby groups, where there are regular mailings of standard letters. For home use, Micro Wordcraft contains all the facilities you could ever need, at a price you can easily afford!

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